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USERS MANUAL FOR STREAMTUBE CURVATURE ANALYSIS

ANALYTICAL METHOD FOR PREDICTING THE PRESSURE DISTRIBUTION ABOUT A NACELLE AT TRANSONIC SPEEDS

VOLUME I

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16. Abstract

The report describes the computer program, Streamtube Curvature Analysis, for the engineering user and for the programmer. The user oriented documentation includes a description of the mathematical governing equations, their use in the solution, and the method of solution. The general logical flow of the program is outlined and detailed instructions for program usage and operation are explained. General procedures for program use and the program capabilities and limitations are described.

From the standpoint of the programmer, the overlay structure of the program is described. The various storage tables are defined and their uses explained. The input and output are discussed in detail. The program listing includes numerous comments so that the logical flow within the program is easily followed. A test case showing input data and output format is included as well as an error printout description.

The details of the mathematical formulation are described in a separate reference.

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1.0 INTRODUCTION

Aircraft have been designed with the NASA-developed supercritical wing to fly at cruise Mach numbers approaching one. The need for low-installed drag and high-drag-divergence Mach number nacelle installations is necessary to the success of this design. Design techniques are required to evaluate these nacelles on an isolated basis and then on an installed or integrated basis.

For this reason NASA has a program underway to provide design information for low-drag, high-drag-divergence Mach number isolated nacelles suitable for use with advanced high bypass ratio turbofan engines. One element of such a program was the development of a method to predict the inviscid pressure distribution and flow field about an arbitrary axisymmetric ducted body at transonic speeds. The prediction technique will provide the means to conduct parametric studies so that the nacelle design criteria could be evaluated to select configurations for further experimental investigations. The prediction technique would provide guidance during wind tunnel testing to develop nacelle shapes which would minimize drag within given design restraints.

Several techniques of solving the inviscid equations of motion about arbitrary two- or three-dimensional bodies at transonic speeds are presently available; however, there are no computer programs available which treat air inlet or nacelle configurations. The objective of the development of this computer analysis was the prediction of flow fields about isolated nacelles at transonic conditions. The solution technique was further specified to give accurate results consistent with the requirement of relatively short computing time per input case as compared to that required for a time dependent finite difference method of solution. The method utilized to compute the flow field is the Streamtube Curvature Relaxation technique.

The Streamtube Curvature Method (STC) of solving external flows has not been discussed significantly in the literature; however, the method is a very natural one. For example, engineers frequently rely on one-dimensional compressible flow relationships for a first-order solution to ducted flows.

The STC approach is similar except that a number of confluent streamtubes, with slightly different properties, are added together to obtain the total flow in the channel. Each streamtube is handled in much the same way as is the one streamtube in the one-dimensional problem. In the limit, as the size of the individual streamtubes approaches zero, the STC method satisfies the inviscid equations of motion exactly.

This report describes the structure of the computer program, Streamtube Curvature Analysis (STC), and the program usage and operation. Two types of information are included in this User's Manual, 1) user oriented input sheets and output definitions along with one example case, and 2) programmer oriented descriptions showing program structure, program nomenclature, program messages and error codes, and operating instructions. The program listing is included as a separate document.

2.0 CONTENTS

VOLUME I - STREAMTUBE CURVATURE PROGRAM

LIST OF FIGURES

3.0 PROBLEM DESCRIPTION

The *Streamtube Curvature Analysis* was formulated as a computer program to solve the inviscid equations of motion over a two-dimensional body (plane or axisymmetric) at transonic speeds. The computer program determines the flow field properties, streamlines, and pressure distribution over typical isolated nacelles and calculates the external pressure drag and the additive drag. (The additive drag is defined as the integral of pressure multiplied by the axial projection of the area taken along the entering streamtube from the undisturbed free stream conditions to the stagnation line on the cowl lip.) The solution is the direct type in that nacelle shape, mass flows, and flight Mach number shall be the prime input data.

The computer program is capable of analyzing the following geometries:

a. Two-dimensional inviscid inlet problems without side spillage at zero or finite angle of attack.

b. Axisymmetric zero-angle-of-attack isolated nacelle problem with:

   1. Short cowl nacelle in which fan duct air of a turbofan engine exhausts upstream of the primary air nozzle, and the pressure distribution on the aft nacelle (waist cowl) must be determined.

   2. Long duct nacelle in which the exhausts of both streams are confluent at the exit or mixed upstream at the exit.

c. In all cases, the flow field may be calculated in the presence of a centerbody (or ramp) whose leading edge may be positioned either forward or aft of the cowl lip plane.

The flow field boundaries can be located as far upstream, and laterally displaced from the nacelle as far as practicable, to ensure minimum disturbances at the boundary and as far downstream as necessary to ensure correct nacelle trailing edge flow conditions. The program is capable of computing the inlet internal flow up to the assumed location of the engine face. The exhaust nozzle weight flow and aerothermodynamic properties of the exhaust flow shall be input quantities. The velocity of the exhaust shall be sonic or greater.

The computer analysis is capable of predicting the approximate location of any embedded normal shock in the transonic flow field over the nacelle. It was also desired that the analysis include free-stream Mach numbers greater than one by using the approximate method of Moeckel for the bow shock shape, but the STC approach was not compatible with the approximate bow wave definition.

The computer program was structured so that two separate computer source decks can be set up. One deck was limited by the requirement that the central memory storage could not exceed $70{,}000_8$ (octal) locations on a CDC 6400 and/or 6600 computer and was thus restricted to a relatively coarse computational mesh network. The second deck utilized a finer computational mesh and included refinements in the stagnation line region and in regions of high velocity gradients. The refined version was limited to a central memory storage not to exceed $140{,}000_8$ (octal) locations. In actuality, the most useful deck utilizes 768 grid intersection points and uses a central memory storage of 106,000 octal locations.

The size of central memory storage required is a function of the defined table sizes. These table sizes may be changed to meet the user's needs. The method to change the table size is included in this User's Manual. Otherwise, the basic logic of the STC program is identical and all the capabilities defined above are always available.

The coding of the computer program meets the following requirements:

1. The program has been written to run on the LRC's CDC 6400 and/or 6600 computers, or any similar CDC 6400 and/or 6600.

2. The bulk of the computer program has been coded in CDC FORTRAN 2.3 language. At least one subroutine has been coded in CDC Compass 1.1 language. The programs have been written to run under the SCOPE 3.1 operating system.

3. All input/output has been accomplished with CDC FORTRAN 2.3 statements. The standard system file names of INPUT for card reading and OUTPUT for printing have been used. In addition, input from tape files and output to tape files has been used.

The description of the required capabilities of STC do not include all possible features that are included in the computer analysis. The user has control over the amount of grid refinement or computational mesh size, both by specifying local areas of mesh refinement and by setting the number of overall flow field refinements. The input geometry may be specified as coordinates only or co-ordinates and local surface angles on any boundary. Multiple channels may be defined so that inlets with acoustic splitters can be analyzed.

4.0 METHOD OF SOLUTION

4.1 Basic Equations

The STC Program is designed to solve the equations of motion along streamlines, ψ = constant lines, and along lines which are orthogonal to the streamlines, ξ = constant lines. The variable ξ is introduced to avoid confusion with the velocity potential ϕ which is only applicable when the flow is irrotational.

Across the streamlines, the continuity and Crocco form of the momentum equation are written:

Continuity:
$$\partial A = \frac{\partial \psi}{\rho V} \qquad (\xi = \text{Const}) \qquad (1)$$

Momentum:
$$\frac{1}{2}\frac{\partial (V^2)}{\partial n} = -\frac{V^2}{rm} + \frac{\partial H}{\partial n} - T\frac{\partial S}{\partial n} \qquad (\xi = \text{Const}) \qquad (2)$$

Along the streamlines the following forms of the energy and momentum equations apply:

Momentum:
$$\frac{DS}{Ds} = 0 \qquad (\psi = \text{Const}) \qquad (3)$$

Energy:
$$\frac{DH}{Ds} = 0 \qquad (\psi = \text{Const}) \qquad (4)$$

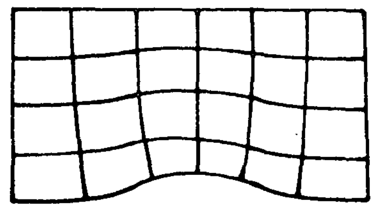
where:

A	=	Flow cross-sectional area = $\int 2\pi r \partial n$
C	=	Curvature of the streamline
H	=	Stagnation enthalpy
n	=	Distance along the orthogonal
p	=	Static pressure
r	=	Radial coordinate
s	=	Distance along the streamline
S	=	Entropy
T	=	Static temperature
V	=	Velocity
ψ, W	=	Stream function, cumulative flow rate
ρ	=	Density

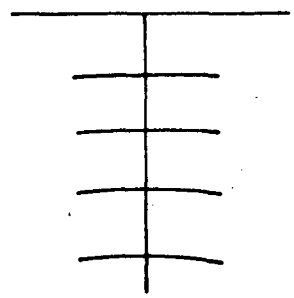
The solution method is an extension of the streamline curvature method. It may be briefly described as follows: First a crude grid of streamlines and orthogonal lines are assumed. (Please refer to Fig. 4-1). Second, the curvature of the streamlines at each of the grid points is evaluated. Third, the momentum equation is integrated along a line normal to the streamlines to obtain velocity and the continuity equation is integrated to determine the "correct" streamline positions (for the assumed curvature field). These are indicated by the "x" in Fig. 4-1. Fourth, an adjustment, δn, is computed by considering (1) the difference between the computed and assumed streamline positions and (2) the effect of the implied curvature modification in the integrated momentum equation. Finally, the streamlines are repositioned by the δn values.

Because the movement of any one grid point alters, through a change in curvature, the velocity at nearby points, it is highly desirable to account for these interrelating point adjustments simultaneously. The utilization of a simultaneous solution procedure, employed here, is not part of the classical streamline curvature method [1, 2, 3]. In comparison, the classical method yields calculation times which are very slow, especially for a closely spaced calculation grid. In concept, the set of simultaneous equations for

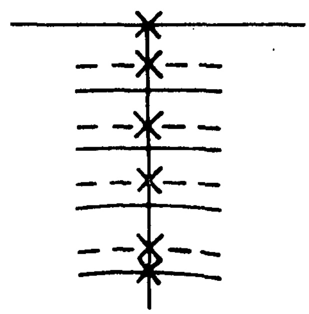
1. Assume a Crude Grid



2. Evaluate Curvature



3. Integrate The Cross-stream Momentum Eqn. and Continuity Eqn. To Determine The "Correct" Streamline Positions.



4. Solve The Matrix Equation for δn and Move The Grid Points.

Fig. 4-1 Solution Technique

the normal streamline adjustments are formulated from the finite difference equivalent of the following equation:

$$\frac{\partial^2 (\delta n)}{\partial \psi^2} + \frac{(1 - M^2)}{(\rho V)^2} \frac{\partial^2 (\delta n)}{\partial s^2} = F \tag{5}$$

where:

δn = Required streamline adjustment in the normal direction

ψ = Stream function

s = Curvilinear distance along a given streamline

M = Mach number

ρV = Flow per unit area

F = Driving (or error) function derived from the solution to the integral continuity and normal momentum equations.

This equation is derived in (Ref. 4) for the special case of isentropic 2-dimensional flow. (These limiting assumptions are utilized only to maintain simplicity of illustration; they are not part of the computer program.) From a mathematical point of view, the above equation is similar to the conventional equations for velocity potential or stream function, namely,

$$(1 - M_y^2) \frac{\partial^2 \phi}{\partial y^2} - 2M_x M_y \frac{\partial^2 \phi}{\partial x \, \partial y} + (1 - M_x^2) \frac{\partial^2 \phi}{\partial x^2} = 0 \tag{6}$$

$$(1 - M_y^2) \frac{\partial^2 \psi}{\partial y^2} - 2M_x M_y \frac{\partial^2 \psi}{\partial x \, \partial y} + (1 - M_x^2) \frac{\partial^2 \psi}{\partial x^2} = 0 \tag{7}$$

where

x and y are coordinates in a two-dimensional rectangular system and ϕ and ψ are the velocity potential and stream function, respectively. (Again, all of the equations have been restricted to isentropic flow for illustration.)

However, for the purpose of calculating transonic flow, the use of Eq. (5) offers a distinct advantage over Eqs. (6) or (7) for the following reason: Because the grid is always alligned in the streamline and normal to streamline directions, no cross-derivatives appear. In consequence, the finite difference star is simply switched from a subsonic representation to a supersonic representation illustrated in Fig. 4-2.

Notice that for supersonic flow, no points downstream of the orthogonal line are included. This reflects the physical reality that disturbances downstream will not affect the flow upstream. It is, of course, because the coefficient term, $(1-M^2)$, passes through zero and changes sign that the star-switching noted in Fig. 4-2 is appropriate.

If the grid system is not alligned with the flow direction, a cross derivative appears in the equation, as in Eq. (6). Unfortunately, the mixed derivative coefficient, $M_x M_y$, does not have the same sign change property and, therefore, star-switching with this equation is more difficult for general flows with some angularity.

The extended streamline curvature method, here referred to as the Streamtube Curvature (STC) method, has then the following features:

- No additional complexities arise when the flow is rotational.
- The slip lines between the exhaust jet and the external flows can be handled precisely. (The procedure is to consider two coincident streamlines. Their position and pressure are the same; their velocity and stagnation properties may be different.)
- From a numerical point of view, the streamline/orthogonal line oriented grid facilitates the analysis of transonic fields, as described above.
- The streamline/orthogonal line grid also provides a mapping of the flow field into a rectangular domain. This is helpful from the standpoint of computer program organization.

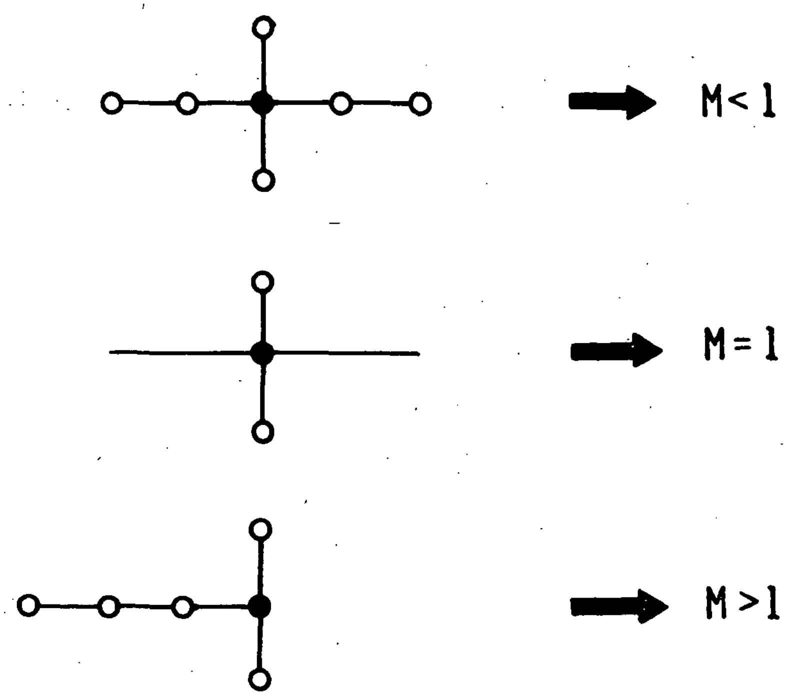


Fig. 4-2 Finite Difference Stars for Subsonic & Supersonic Flow

The STC Program has also been designed

- o to handle multiple streams,
- o to adjust the flow rates of the jet exhaust streams to meet the (2-dimensional) choking condition,
- o to place grid points at locations in the flow field where they are needed, as determined by local variations of the dependent variables, and
- o to allow external flow analysis by incorporating matched near-field and far-field solutions. The far-field solutions are obtained analytically, utilizing small perturbation theory.

4.2 An Outline of The Calculation Steps

The operations performed by the STC Program may be outlined as follows:

1. Define the flow regions and locate (approximately) the "primary" orthogonals and the streamlines which divide the internal and external flows.
2. Refine the grid as required by inserting additional streamlines and orthogonal lines between those already existing.
3. Compute the streamline angles and curvatures.
4. Compute the orthogonal line angles and move the grid points along the streamlines to obtain orthogonality.
5. Compute the velocities on the "far-field" boundary.
6. Adjust the flow rates in the exhaust streams, if any, to meet the calculated choking flow rate.
7. Integrate along each orthogonal the momentum and continuity equations [Eqs. (1) and (2)].
8. Determine if the streamline positions are within a "rough tolerance". If so, return to Step 2 for additional grid refinement (unless grid refinement limits have already been reached). Otherwise, continue to Step 9.

9. Determine if the streamline positions are within final tolerance. If so, jump to Step 13. Otherwise continue to Step 10.

10. Set up the matrix equation for the streamline correction, δn.

11. Solve the matrix equation.

12. Modify the streamline positions by δn, and return to Step 3.

13. Calculate and print the output quantities; then return to Step 1 for the next case, if any.

The first operation includes reading the card input for a description of the geometry and flow properties. The computer program has been written to have general capability for analyzing a great variety of configurations. The first step in the programmed logic is to develop a table of orthogonals or calculation stations for each of the several flow regions. The regions are determined as illustrated in Fig. 4-3 so the calculation can proceed from upstream to downstream. The boundary of each region is defined as a primary orthogonal. As shown in Fig. 4-4, the initial grid which is developed contains only the primary orthogonals and the double streamlines which separate the various streams.

The second step in the computational procedure is the grid refinement. The very crude grid, obtained in Step 1, is refined before the first solution of the flow field equations is executed. A new orthogonal is placed within each region and, likewise, a streamline is inserted in the middle of each channel. In the external channel, additional streamlines are placed close to the body. After the solution has been obtained for this net, the grid intervals are halved as required. This may be likened to the steps taken when one "flux plots" a flow field by hand. First, major flow lines and normals are sketched in, and then more and more streamlines and orthogonal lines are added until the desired resolution is obtained. At each step in the process the positions of the lines are adjusted to meet the correct solution requirements. The procedure automatically provides for grid refinement in regions of high curvature and high acceleration or deceleration. The streamline and orthogonal lines which are added between existing lines are not required to span the field if

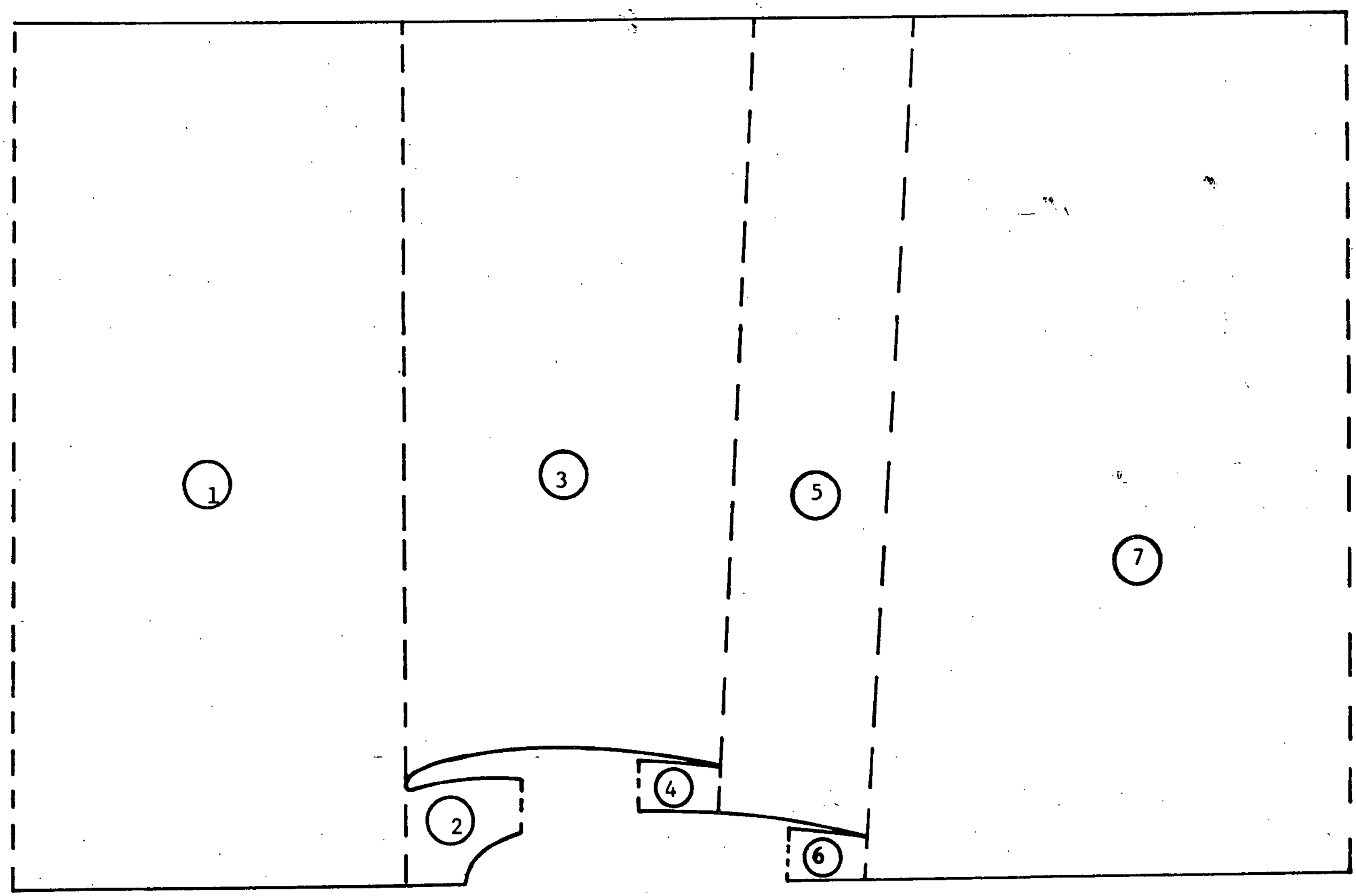


FIGURE 4-3 SUBDIVISION OF THE FLOW FIELD INTO REGIONS

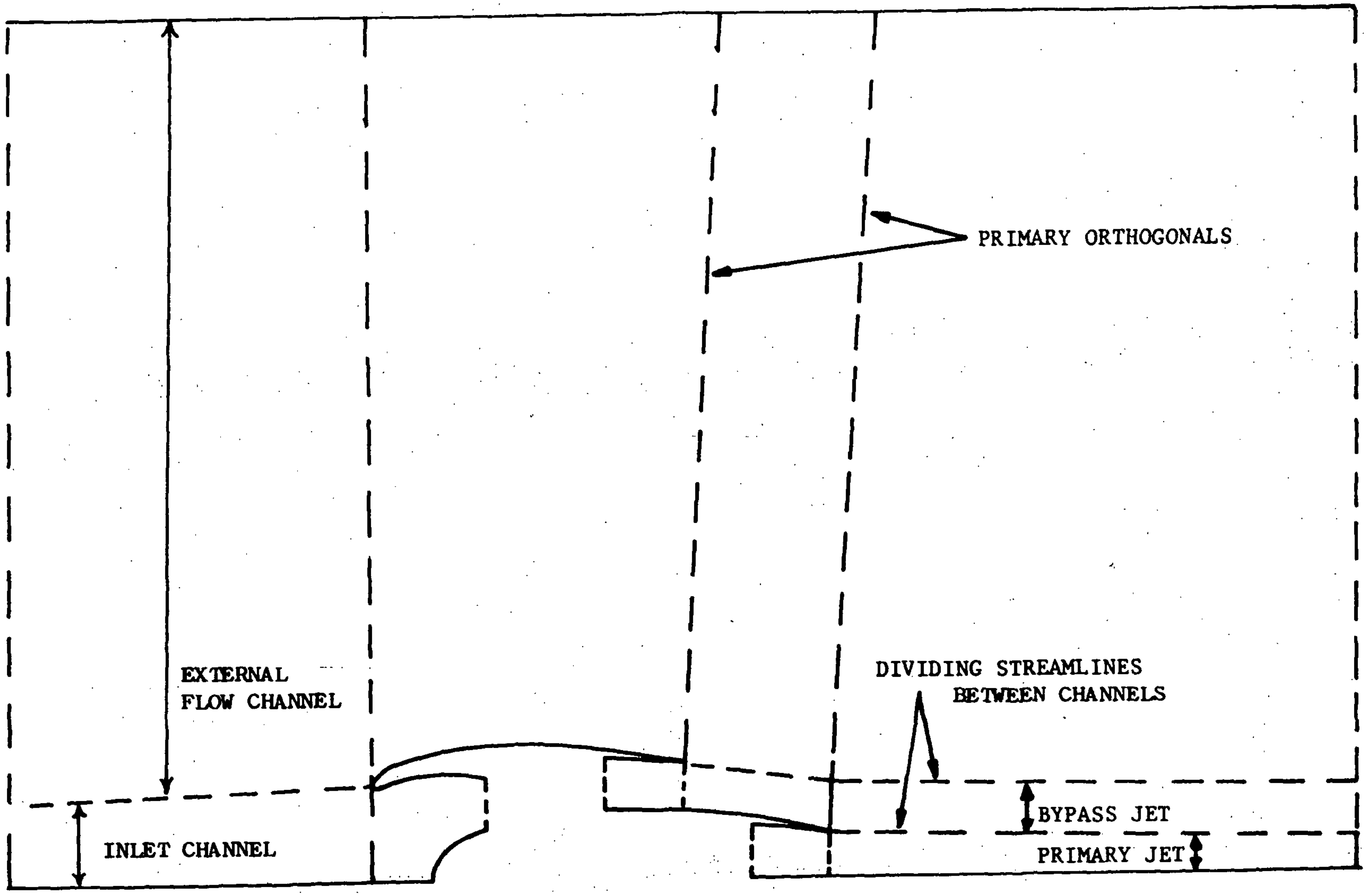


FIGURE 4-1 INITIAL STREAMLINE/ORTHOGONAL GRID BEFORE THE FIRST REFINEMENT

only local refinement, near the body, is required. The refinement procedure presently built into the program uses a criteria involving the distance and velocity increment between grid points. These refinement criteria are discussed in detail in Section 10 and 12.

The third step in the method is to determine the angles and curvatures of the streamlines at each grid point. For subsonic portions of the flow field this is performed by fitting a piecewise continuous cubic polynominal in a coordinate system which is locally rotated for each interval. The resulting fit is analogous to the curve produced by a beam which is loaded by discrete forces so as to pass through the given grid points. The locally rotated coordinate system removes the restriction that requires the slope to be small. For grid points located in a supersonic region, backward difference formulas are employed. Either 3-point, 4-point, or 5-point formulas may be optionally selected. Again the coordinate system is rotated so that slopes in the curve fitting coordinate system are small.

In the fourth step the orthogonality of the grid points is checked and points are moved along the spline curve as required to achieve normal intersections between the two sets of lines. Also, the normal distance, n, is computed for each grid point as measured from the lower boundary of the orthogonal.

When the initial grid is set up, a boundary is placed some distance away from the body. This boundary becomes the interface between the near-field and far-field solutions. The near-field is computed by the streamtube curvature method and the far-field is computed by linear small perturbation theory. In the process of iterating, this boundary (which is also a streamline) will float so that its shape and velocity distribution are matched by both the inner and outer solutions. In practice, the shape of the interface streamline (also referred to as the far-field boundary) is first assumed. Using the far-field equations, the velocity distribution is calculated. This is Step 5. These velocities are subsequently employed in the near-field analysis and from this comes a revised shape for the interface streamline. Revised velocities will then be computed in Step 5 during the following iteration cycle, and so forth.

Step 6 is the modification, as required, of the flow rates of the exhaust streams. For boattail analysis of nacelles, the internal geometry of the exhaust passage is required input to the STC program. Because of streamline curvature effects, the discharge coefficient for the nozzle will be somewhat less than unity. The user, however, may input a flow rate based on unity discharge flow coefficient or, for the matter, any approximate value. Determination of the velocity distribution across the throat of the nozzle will be determined within the STC framework and the evaluation of the maximum "choked" flow rate is Step 6 of the calculation procedure.

Step 7 is the solution of the flow field equations per se. This section of the program is referred to as the "flow balance"; Eqs. (1) and (2) are integrated. In the external regions of the field, the momentum equation is integrated from the far-field interface boundary to the body (or to the centerline or lower boundary, whichever exists). The integral form of the momentum equation is:

$$\ln V_o^2 - \ln V_{FF}^2 = 2 \int_{n_o}^{n_{FF}} C_{dn} \tag{8}$$

where:

V_{FF} = Velocity as determined in Step 5 along the far-field streamline.

V_o = Velocity at any streamline with orthogonal distance n_o.

n_{FF} = Distance measured along the orthogonal to the far-field streamline.

Although not reflected in Eq. (8), the effect of varying total pressure behind a shock wave is also included. Also, if a slip-line occurs in the field, the velocity jump equations,

$$P_S = P_{T_+}\left[\frac{T_{S_+}}{T_{T_+}}\right]^{\frac{\gamma}{\gamma-1}} = P_{T-}\left[\frac{T_{S_-}}{T_{T_-}}\right]^{\frac{\gamma}{\gamma-1}} \tag{9a}$$

$$C_{P_+} T_{T_+} + \frac{V_+^2}{2} = H_+ \tag{9b}$$

$$C_{P_-} T_{T_-} + \frac{V_-^2}{2} = H_- \tag{9c}$$

are employed where the subscripts (+) and (-) denote conditions on the streamlines above and below the slip-line, respectively.

The velocity, total temperature and total pressure allow determination of the density at each grid point, and the inverse product of density and velocity is integrated to find flow area.

$$A_2 - A_1 = \int_{\psi_1}^{\psi_2} \frac{\partial\psi}{\rho V} \tag{10}$$

The cumulative flow areas calculated by Eq. (10) are compared with the geometric areas of the streamlines used in Step 3. The difference between these two values is used as a convergence check (Steps 8 and 9) and in the streamline correction equation, Step 10.

For internal flow orthogonals, the velocity at the outer boundary (V_{FF} in Eq. (8)) is not known. Instead, an iteration process is employed whereby the outer boundary velocity is varied to obtain a match in the calculated geometric passage area.

In Steps 10 and 11 the proper adjustment of the streamline positions is determined and in Step 12 the grid points are moved in the normal direction by this computed adjustment.

The iterative sequence is to start with a crude grid, as noted above, and to repeat Step 3 through 12 until the flow balance error is small. This is often accomplished in one or two iterations. The grid is then refined to the next level and the field is reconverged. The refinement/convergence process is continued until the grid refinement criteria is satisfied, or alternately, until computer storage limits are reached. At this point, additional loops through Steps 3 to 12 may be performed until the flow balance error is satisfactory.

A complete description of the details of the numerical procedure is contained in Reference 4.

5.0 PROGRAM DESCRIPTION

5.1 Data Storage Tables

The framework of the STC program is designed to allow flexibility as to the configuration to be analyzed. For example, very weak limits are placed on the number of flow boundaries and the number of channels into which the flow is split. And no specific limits are placed on the number of streamlines or the number of orthogonal lines in any given region of the flow. To acomplish this, the bulk of the calculation data is saved in arrays which are singly dimensioned. Within each array the data are packed together to maximize storage efficiency. Descriptions of these tables are provided below.

5.1.1 Field Tables

Flow field data are stored in singly subscripted arrays, one for each variable. The quantities saved at each streamline -orthogonal line grid intersection are as follows:

Z	axial position, abscissa
R	radial or vertical position, ordinate
VM	velocity
PHI1	streamline angle, measured from horizontal
CURV	curvature of the streamline, $-d\phi/ds_1$
S1	curvilinear distance along the streamline
S2	curvilinear distance along the orthogonal line
B	coefficient in matrix equation for DS2, indicator of subsonic (B>O) or supersonic (B<0) velocity
RHS	right hand side of matrix equation for DS2
DS2	correction of streamline positions

In the Fortran coding M is the symbol commonly used as the subscript for the above arrays and NM is the number of field points (or maximum value of M). The points are grouped by orthogonals starting at the upstream orthogonal. Points along the orthogonal are grouped together.

Hence, the point below and above the M^{th} point are (M-1) and (M+1) respectively. The neighbors in the streamwise direction, however, are determined by referring to the JMS-table described in Section 5.2.

5.1.2 Channel Input Data Table

Information such as the boundary coordinates and flow properties is compactly stored in a single array, TABLES, so that only the total amount of information saved is limited by the array size. No limit is placed on the amount of information to be placed in any one Table of which there are six:

- channel input table
- boundary table
- table of convected properties
- table of wake displacement thickness
- flow adjustment table
- station table

In the first table, CHDATA, input information read from page STC/sheet-3 is stored. The information is stored in subtables, one subtable for each channel, and the arrangement of each subtable is as follows:

CHNAM	channel name (BCD)
LHNEXT	length of subtable
WTFLOW	flow rate (if input)
TTO	total temperature
PTO	total pressure
TSO	static temperature
PSO	static pressure
MACHO	Mach number
AO	flow cross-section area
VARY	indicator as to whether the flow rate may be varied
RG	gas instant
GAM	ratio of specific heats

NR	not operational
NC	" "
TAB	" "
BB(NR&NC)	not operational, zero length array

Except for the first two words, CHNAM and LHNEXT, all of the above input items are optional input and they are all equal to BITS unless values are supplied according to input instructions for STC/Sheet-3. If data for a second channel are supplied, these data will follow the first channel and so forth for any number of channels. The first word of the CHDATA table is at location LHO and the last word is at location LHE relative to the origin of the TABLES-array. If LHE=LHO-1, no channel data has been input and the channel data table has zero length. In the Fortran coding, the subscript LH is used to refer to the channel data.

Channel information is read into the STC program by subroutine RCD; the stored channel data is utilized by routines RTCFI, BCONV, ADJWF and ISBOT.

5.1.3 Boundary Table

Directly following the channel data are the coordinates of the boundaries. Again a subtable for each boundary is constructed and the information is stored in the following order:

BDT	boundary name
LBNEXT	length of subtable
LBZ1	index increment to first coordinate in ZBT, RBT, ANGBT-lists
CHNAME	channel with which the boundary data is associated
UP	upper or lower boundary indicator (if the boundaries around a leading edge have been collated together, then CHNAME(2)=UP is the name of the channel above the leading edge and CHNAME(1) is the name of the channel below the leading edge).

LEDEX	index (relative to ZBT, RBT, ANGBT) of the leading edge point when boundaries are collated
ZBT(1)	axial coordinate (x)
RBT(1)	radial coordinate (y)
ANGBT(1)	surface angle (measured from x-axis in radians)
ZBT(2)	
RBT(2)	
ANGBT(2)	
o	
o	
o	
o	
BDNAME	name of a specific boundary when several boundaries are collated together in one subtable
LBA, LBB	index limits relative to ZBT, RBT, ANGBT of the coordinates for BDNAME

(NOTE - the above 3 items are repeated for each boundary where LBZ1/3 is the number of collated boundaries. The existence of this information results in the displacement of the ZBT, RBT, ANGBT coordinates to higher memory locations. BDNAME, LBA and LBB are equivalenced to ZBT, RBT and ANGBT respectively).

Boundary coordinates are necessary input to the program so two or more subtables will always exist, stacked one after another. The first word of the BDYTAB table is at location LBDO and the last word is at location LBDE. LB is the subscript used to refer to the boundary data.

Boundary coordinates as supplied on page STC/Sheet-2 of the input sheets are read by routine RBD. This routine converts the angles from degrees

to radians, translates and rotates the coordinates as required and stores the points so that as one proceeds from one point to the next (or walks along the contour) one's left arm is next to the flow field. Thus, the ordering of points on an upper flow boundary will be reversed and the angles incremented by 180 degrees.

The several boundaries which may be defined to comprise one continuous contour are collated in subroutine BLDTAB. The boundary table is referenced in routine BDYPTM.

5.1.4 Table of Convected Properties

For each channel, a subtable of convected properties and channel flow data is built by subroutine BCONVT from data in the channel input table (if it exists) and input data from STC/sheet 1. This table contains some of the same information as the CHDATA table. Information contained in the CONVTB table is complete and follows a consistent format.

CH	channel name
LTNEXT	length of subtable
NPT	not operational (=1)
LPSI	(=15)
LTT	(=16)
LPT	(=17)
LRCU	(=18)
CRG	gas constant
CPGJ	specific heat at constant pressure
C2CP	twice CPGJ
QGAM	inverse of ratio of specific heats, = $1/\gamma$
FGT	$(\gamma-1)/\gamma$
FGP	$\gamma/(\gamma-1)$
FGR	$1/(\gamma-1)$
AREATB	area for calculating flow rate
PSI	flow rate for the channel

TT	stagnation temperature
PT	stagnation pressure
RCU	not operational

Again the data for the several channels are stacked one after another. LTO and LTE are the first and last locations of the table relative to the origin of TABLES. LT is the subscript used to retrieve convected property information in subroutines BLDTBS, RBCONV, ADJWF and TTPT.

5.1.5 Table of Wake Displacement Thickness

The wake displacement table is only constructed if there exists a blunt trailing edge, and is arranged as follows:

X2W	streamline coordinate, ξ_2
LWNEXT	length of subtable, = 2N+2
S1W (1)	list of distances from trailing edge
S1W (2)	
:	
S1W (N)	
DST (1)	list of wake displacement thicknesses
DST (2)	
:	
DST (N)	

This table is built in the subroutine BLDTBS. DST is determined so that the wake thickness equals the trailing edge thickness at S1W=0. Thereafter the wake thickness decrease at the rate of 0.1 times the distance from the trailing edge. At 10 trailing edge thicknesses downstream, the wake thickness is zero.

As many wake thickness subtables are built as there are blunt trailing edges. The wake thickness table begins within the TABLES-array at location LWO and ends at LWE. The table is referenced by the TTPT routine.

5.1.6 Flow Adjustment Table

The flow adjustment table is also created in the BLDTBS routine, one subtable for each trailing edge. The information contained is as follows:

X1F	orthogonal coordinate of the t.e., ξ_1
X2F	streamline coordinate of the t.e., ξ_2
X1BF	ξ_1 coordinate of the choked station of the flow below the t.e. if not X1F
X1AF	ξ_1 coordinate of the choked station of the flow above the t.e. if not X1F
S1F	curvilinear streamline distance to the trailing edge (along the upper surface of the airfoil). This value is used for interpolating the wake displacement thickness.
NCHB	number of channels below the t.e.
NCHA	" " " above " "
JORDER	= -1 if the single channel flow is choked = 1 if channel flow rates below the t.e. are known = 2 if channel flow rates above the t.e. are known
VNR (12)	12 element storage array used by subroutine NEWRAP for the flow iteration

The data stored in this table is used by subroutine ADJWF which adjusts the flow so that at each trailing edge the pressure difference from one side of the trailing edge to the other is reduced to zero (to satisfy the kutta condition). If this condition cannot be satisfied, the flow in one of the channels will be choked and routine ADJWF adjusts the flow to the maximum choked value. The flow adjustment table is located between LFO and LFE. Each subtable is NFCOLS (=20) in length.

5.1.7 Station Table

The station table is the last of the compacted tables (except for the shock point table which is appended to it) and it contains information

for each orthogonal line. The table grows during the calculation process because the number of orthogonals is increased to obtain a refined grid. Because it is the last table it can easily be extended into the unused portion of the allotted memory. The data saved for each of the orthogonals is arranged in the station table as follows:

X1	station coordinate, ξ_1
LNEXT	length of subtable
MLB	field point index of first (lower boundary) point of the orthogonal
MUB	field point index of the last (upper boundary) point of the orthogonal
PRIM	primary station indicator, T or F, (a primary station, is one of the original grid stations and it will pass through boundary end points).
TYPELB	type of the lower boundary, i.e. SOLID, FIELD, FARFLD, etc. for indicating proper boundary condition
NAMELB	name of the lower boundary used for referencing the boundary table
ILB	boundary (table) interval of the orthogonal boundary intersection
FLB	fractional position in that interval
S1LB	curvilinear distance from beginning of the interval
TYPEUB	type of the upper boundary
NAMEUB	name of the upper boundary
IUB	interval of the upper boundary
FUB	fractional position in the interval
S1UB	curvilinear distance from the beginning of the interval
VMB	boundary velocity, used as an initial guess for the velocity iteration in the FLOBAL routine

DWDV, SCHOKE	slope of the flows rate versus velocity curve used for the velocity iteration in the FLOBAL routine, = SCHOKE if flow is choked at this station
X2CL	ξ_2 coordinate of the control streamline used for positioning orthogonal lines in the PTMOVE routine
SLSWI	sonic line-shock wave indicator, = 1.0 for mixed flow, = 0. otherwise
MCL	field point index of control streamline, used in PTMOVE only

This group of 20 items is repeated for each station. starting with the upstream and proceeding to the downstream stations. Field point calculations are then performed by looping through the station table, starting with the first station at L=LO and proceeding to the last station. The last word of the last station is at location LESTA.

The above set of six tables is initially constructed with gaps between each table. The channel data and boundary tables are constructed simultaneously in the RCD and RDC routines called from REDINP. The maximum size of the channel data routine is preset by the value of MAXLH. MAXLH is initialized to 400 but may be input as any value if such should be necessary.

After reading the card data input, at the beginning of the BLDTAB routine, the boundary data is moved down in memory so that it is just above the channel data. The gap between the two tables is thus eliminated.

The remaining four tables are then all built in subroutine BLDTBS. Again spaces between the tables are provided so that they can be constructed simultaneously and grow to the following lengths without interfering with each other:

Table Name	Input Variable Name	Default Value
Convected Properties	MAXLT	200
Wake Displacement Thickness	MAXLW	200
Flow Adjustment	MAXLF	200

At the end of the BLDTBS routine the gaps between the tables are eliminated by moving each table down in memory. The result is that all information contained in these tables is stored compactly, and the last table, the station table, has space into which it may expand. The length of all six tables combined is limited to the length of the TABLES-array, and this value is adjusted at program load time to meet the size requirements of the flow field.

5.1.8 Streamline Table

The streamline table is not stored in a compact arrangement. It consists of three arrays in a labled common SLTAB.

W	cumulative flow rate for the channel
X2	ξ_2 - coordinate
SLCHN	channel name of which this streamline is a part

The streamline number, J, is the subscript used to access information in each of these three arrays. All of the streamlines for a given channel are together and in order (proceeding away from the centerline). However, no special ordering of channels is required.

5.1.9 Table of Leading Edge and Trailing Edge Points

The Leading Edge-Trailing Edge Point (LETEPT) table is constructed in routine BLDTAB and used in routine BLDTBS for the purpose of defining the flow regions and primary orthogonals. The data in this table is not saved after the BLDTBS routine is executed.

The information in this table is obtained from the boundary table. The ends of boundaries and double points contained within the boundaries are listed, together with the boundary and channel names. Each "line" of the LETEPT table contains the following ten items.

XE	axial coordinate of boundary end point or double point
YE	radial or vertical coordinate
ANGE	mean angle of the flow at XE, YE
NLE	number of times the same point has occurred as an upstream boundary end point. Normally NLE=0 or 1. If NLE=2 then the point is a leading edge.
NTE	number of times point has occurred as a downstream end point. NTE=2 for trailing edge point. NLE=NTE=0 for a double point in the boundary table
CHL	name of flow stream above point
CHU	name of flow stream below point
BDL	name of boundary (UPPER=F)
BDU	name of boundary (Upper=T)
NUSED	number of times the point has been used in developing the ORTCHN-table, initially = -1 for a double point

After the table is constructed the points (or lines) are sorted so that the upstream points are first and the points follow from upstream to downstream in order. If difficulty is encountered in the development of the basic grid, the information contained in the LETEPT-table may be helpful in diagnosing the error.

5.1.10 Table of Channels Embraced by Each Orthogonal

The LETEPT-table contains all points through which (primary) orthogonal lines are to pass. From this table the ORTCHN-table is developed as an aid to the construction of the initial grid of streamlines and orthogonal lines. The latter table contains a list of all of the channels embraced by each orthogonal. Specifically each "line" of the table contains:

LEDGE	index of the point in the LETEPT-table
LRPREV	previous line number (or ORTCHN-table index) of the upstream orthogonal
CHNA(1)	channel names
CHNA(2)	" "
CHNA	" "
CHNA(2)	" "

The above information is tabulated (one line) for each orthogonal. Also, the first two lines are developed as dummies for the purpose of listing all channels. Other dummy lines may also be inserted. LRD is the index increment between lines and is equal to the total number of channels minus two.

5.1.11 Table of Index Limits

The labeled common /IXØRIG/ contains the index limits for each of the above listed tables. The items and order of storage are as follows:

LHO	location of channel table origin
LHE	location of channel table end
LBDO	location of boundary table origin
LBDE	location of boundary table end
LTO	location of convected properties table origin
LTE	location of convected properties table end
LWO	location of wake displacement thickness table origin
LWE	location of wake displacement thickness table end
LFO	location of flow adjustment table origin
LFE	location of flow adjustment table end
LO	location of the station table origin
LESTA	location of the station table end
LSO	location of the shock point table origin
LSE	location of the shock point table end
LDUM(6)	unused
MO	unused
NM	number of field points
NJ	number of streamlines
NFCOLS	number of "columns" in the flow adjustment table
MAXNJ	maximum number of streamlines (dimensional limits are MAXNJ=128)
MAXOL	maximum number of points on any one orthogonal (dimensional limits are MAXOL=96)
MAXNM	maximum length of field arrays, calculated in subroutine REDINP
MAXLE	maximum table length, calculated in subroutine REDINP
LEO	location of the first word in the LETEPT-table, (=1)

LEE	location of the last word in the LETEPT-table
LRO	location of the first word in the ORTCHN-table
LRE	location of the last word in the ORTCHN-table
LRD	the ORTCHN-table is subdivided into lines and LRD is the length of the lines

5.2 Accessing Data in the Field Tables

The data stored in the field tables consist of the Z, R, S1, S2, PHI1, CURV, VM, B, RHS, and DS2 at each point in the field. An additional array termed the JMS table provides access to the information in the field tables. This information (subscripted M=1,NM) consists of:

J	Streamline number
MU	M subscript of upstream grid point; MU = 0 at beginning of streamline.
MD	M subscript of downstream grid point; MD = 0 at end of streamline.
ISTAG	Point type indicator ISTAG = 0 - Normal point. 1 - Stagnation (or singularity) point. 2 - Trailing edge point or a point fixed on the body surface used to locate a primary. orthogonal. 3 - Point adjacent to a stagnation (singularity) point or an end point of a partial orthogonal.

The word content of each JMS entry is:

GE-635

(36 bit word)		J	MU	MD	ISTAG
		8 bits	13 bits	13 bits	2 bits

CDC-6400/6600

(60 bit word)		J	MU	MD	ISTAG
	24 bits unused	8 bits	13 bits	13 bits	2 bits

On the GE-635, the machine word length presents a practical limit to both the number of streamlines (J = 255) and the maximum field size (NM - 8191) It was felt that these limits represent a convenient maximum for any problem which might be encountered. Hence, the bit configuration for the JMS word on the CDC 6400/6600 is identical to that on the GE635, resulting in an

unused portion of 24 bits. The subroutines which pack and unpack the JMS table entries (SAVIX, GETIX, and GETRLX) are coded in the CDC assembly language COMPASS 1.1 in the interest of increased computation speed. These routines would have to be modified if a problem required a streamline number J in excess of 255 or a grid point index M greater than 8191.

5.3 STC Calculation Steps, Flow Chart, Overlay Description

The present section outlines the sequence of calculation steps performed by the STC Program and describes the overlay structure on the CDC 6400/6600 computers.

5.3.1 STC Calculation Steps & Flow Chart

The processing flow chart for the STC program is shown in Figure 5-1 and includes the principal subroutines, their function, and their associated output. The general calculation steps performed by the STC Program were outlined in Section 4, Method of Solution. Here the calculation steps will be identified with the subroutine performing that step.

The computer program has been written to analyze many types of geometries and flows. The user must identify the various flow boundaries and channels when the program input is compiled. These sets of flow boundaries (BDY) and channel names (CHN) define flow regions with specified properties of temperature, pressure, and velocity. It is the task of the program user to organize his problem so that each flow region is defined by the proper boundary and channel names (see Figure 4-3 and 4-4).

The first operation in the computer program consists of reading the card input for the description of geometry and flow properties in each flow region (REDINP), and then storing and building the various tables (BLDTAB, BLDTBS, BCONV). The channel data, boundary data, and flow property data are each stored in their respective tables. If necessary, the boundary points are smoothed and local angles at each boundary point are calculated.

The field point table and station table are started with the first unrefined grid of orthogonals and dividing streamlines. The boundary of each region is defined as a primary orthogonal. The dividing streamlines which separate the various streams are called double streamlines.

The next step in the computational procedure is to refine the very crude initial grid (REFINE) after calculating the distances between points along streamlines. A new orthogonal is placed within each region and a new streamline is inserted in the middle of each channel. In the external channel (identified by CHN EXT), additional streamlines are placed close to the body. After the solution for this grid has been obtained, the intervals are again halved as required.

As the calculation procedure continues, grid refinement is automatically provided in specified flow regions or in regions of high curvature and high acceleration and deceleration. The streamline and orthogonal lines which are added between existing lines are not required to span the field if only local refinement near a boundary is needed. These refinement criteria are discussed in Section 10 and 12.

After refining the grid, the next step (SLC) in the solution is to determine the angles and curvatures of the streamlines at each grid point. For subsonic portions of the flow field, this is performed by fitting a piecewise continuous cubic polynomial (beam) in a coordinate system which is locally rotated for each interval (Figure 5-3). The locally rotated coordinate system removes the restriction that requires the slope to be small. The matching conditions are the angles and curvatures at each point. At the end of streamlines which terminate at a flow exit boundary or extend to a flow inlet, the end curvature is specified. Normally the end curvature is zero, but the user may input a constant non-zero value of curvature.

For grid points located in a supersonic region, the subroutine SLC employs backward difference formulas in keeping with the switch to the star with no downstream points (Figure 4-2). Either a 3-point parabola, a 4-point piecewise cubic (beam), or a 5-point formula may be optionally selected. The 3-point parabola is preferred. Again the coordinate system is rotated so that slopes

in the curve fitting coordinate system are small. The end conditions for the supersonic curve fit formulas are a specified angle and zero curvature.

One additional task performed by SLC is the location of stagnation points and the definition of the dividing streamline intersecting the boundary at the stagnation point. At leading edges, the dividing streamline is set perpendicular to the boundary surface at the stagnation point, (Figure 5-4). An orthogonal which goes with the stagnation point is defined and the point on the first streamline is positioned.

PTMOVE checks the orthogonality of the grid points and moves the points along the spline curve as required to achieve normal intersections, (Figure 5-5), between the two sets of lines. Also, the normal distance, n, is computed for each grid point as measured from the lower boundary of the orthogonal.

When the near-field grid is defined, a boundary is placed some distance away from the body. This boundary becomes the interface between the near-field and far-field solutions. The near-field is computed by the streamtube curvature method and the far-field is computed by linear small perturbation theory, (Figure 5-6). In the process of iterating, this boundary (which is also a streamline) will float so that its shape and velocity distribution are matched by both the inner and outer solutions. In practice, the shape of the interface streamline (also referred to as the far-field boundary) is first assumed. Using the far-field equations, the velocity distribution is calculated. These velocities computed by FARFLD, are subsequently employed in the near field analysis and from this comes a revised shape for the interface streamline. Revised velocities will then be computed in FARFLD during the following iteration cycle, and so forth. FARFLD is a selected boundary option when the far-field boundary, BDY, is called FF. A solid boundary may also be specified by renaming the far-field boundary and defining the coordinates.

The next step (ADJWF) is the modification, as required, of the flow rates of the exhaust streams. For boattail analysis of nacelles, the internal geometry of the exhaust passage is required input to the STC program. Because of streamline curvature effects, the discharge coefficient for the nozzle will be somewhat less than unity. The user, however, may input a flow rate based

on unity discharge flow coefficient or, for the matter, any approximate value. Determination of the velocity distribution across the throat of the nozzle will be determined within the STC framework and the evaluation of the maximum "choked" flow rate is ADJWF of the calculation procedure.

The next three subroutines, STALOO, BRHS, and FLOBAL, develop the solution to the flow field equations represented by continuity, Eq. 1, and radial or cross-stream momentum, Eq. 2, (Section 4). At each station (STALOO) along a boundary, the flow equations are integrated along an orthogonal (FLOBAL) and the right hand side and the coefficient B ($B = [(1 - M^2)/\rho V^2]$) in Eq. 5 are determined (BRHS). In the external regions of the field, the momentum equation is integrated from the far-field interface boundary to the body (or to the centerline or lower boundary, whichever exists). The cumulative streamtube flow areas are then calculated by integrating the continuity equation and compared with the geometric areas of the streamlines defined by SLC. The differences between the streamline position determined by the "flow balance" FLOBAL and by SLC is used as a convergence check. It also defines the right hand side or driving error function in the streamline correction equation, Eq. 5.

If the streamline positions are within a convergence tolerance the program logic loops back to REFINE. Additional streamlines and orthogonals are added as required by the refinement criteria. The refinement procedure presently built into the program uses a criteria involving the distance and velocity increment between grid points.

If the streamline convergence tolerance has not been met, the streamline correction equation is solved by defining a matrix, MCOEF, and by solving this matrix using one of several methods. The solution techniques include IAD, Implicit Alternating Direction, or LRELAX, Streamline Block Relaxation. The user has control of the choice of solution method, but IAD has demonstrated the more stable and faster solutions.

After calculating the streamline correction, δn, the streamlines are adjusted (ADJSL) to their new positions and the program logic loops back to SLC to define new curvatures and geometric streamtube areas. This loop is called an inner solution. Depending on the amount of grid refinement, the inner loop

may take from 2 to 20 passes to reach streamline convergence.

As soon above, the iterative sequence is to start with a crude grid and to go through subroutines SLC to ADJSL until the flow balance error is small. The grid is then refined to the next level and the field is reconverged. The refinement/convergence process is continued until the grid refinement criteria is satisfied, or alternately, until computer storage limits are reached. At this point, additional inner loops may be performed until the flow balance error is satisfactory.

Finally, the output quantities are calculated and the results are printed in any of several forms. The output forms are defined in Section 7.

5.3.2 STC Overlay Description

The STC program has been structured for execution on the CDC 6400/6600 machines under the SCOPE 3.1 operating system. The basic OVERLAY features of SCOPE 3.1 have been utilized to reduce the memory requirements to those currently in use at the NASA Langley Research Center. Shown in Figure 5-2 is the overlay structure including all subroutines and the important data table storage areas. As indicated in this figure, the program consists of a main overlay, four (4) primary overlays, and six (6) subordinate secondary overlays. A brief description of the processing in each overlay is given in the following section. In this description, the word "link" is used interchangeably with the word "overlay".

Overlay (0, 0) - Entry STCA

The main overlay (0, 0) contains the main program STCA, as well as general purpose subroutines which are called by subprograms in the subsequent primary and secondary overlays. The main program STCA provides control for execution of the STC program by loading the appropriate overlays in sequence and testing for completion or convergence of the problem solution.

Also included in the main overlay is the data storage area consisting of the general program tables, the field tables, and the streamline table as discussed in Section 5.1. This storage area represents the largest block of working storage in the main overlay. The sizes of these various regions of memory are initialized by the block data subprogram USECDG. An increase in the number of available field points, stations or streamlines may be effected simply by recompilation of this block data subprogram and the block data USECDM in overlay (4, 0).

Overlay (1, 0) - Entry STCN

Overlay (1, 0) is the primary overlay for the program input and initial construction of the data tables and the unrefined calculation net. Program STCN serves as a driver routine to call in subordinate secondary overlays. These links in turn read the input and build the initial tables and calculation net. Subroutines used concurrently by secondary links also reside in overlay (1, 0).

Overlay (1, 1) - Entry STCNR

Overlay (1, 1) consists of the subroutines to read the card and/or tape input and perform preliminary processing. General input data are read in REDINP and boundary and channel data are read in RBD and RCD respectively. The channel data input table is also constructed in RCD. In the case of the boundary input, if angles are not specified with the coordinates, the SMΘTH routines are called to calculate angles by fitting a beam through the specified coordinates. Also, the NACA Series 1 Cowl coordinates are stored internally and may be used to generate an "analytic" contour for a specified boundary segment. The input quantities to select these options are discussed in Section 7.1, and on the input sheets (Section 12.2).

Overlay (2, 1) - Entry STCN2

The principal function of overlay (2, 1) is to build the boundary table and the leading edge/trailing edge table using the coordinate and angle data from the preceding link. This procedure is accomplished in subroutine BLDTAB. If specified by input, this overlay is recalled to initialize the matrix for the solution on the far field boundary (FRFDNZ).

Overlay (1, 3) - Entry STCN3

The bulk of initial table construction is performed in subroutine BLDTBS. Specifically, the orthogonal channel table, the streamline table, the station table, the flow adjustment table, and the wake displacement thickness table are built in this routine. Subroutine BCΘNV is called to build the convected properties table as an intermediate task. In the process of table construction, the values of Z, R, S_2, and V for the unrefined grid are placed in the field tables.

Overlay (2, 0) - Entry STCB

Overlay (2, 0) is the primary link for calculation of the coefficient B and the RHS of the streamline correction equation using the "flow balance" relations. The subroutine FLΘBAL and TTPT are included in this link, since they are used by the output routines to calculate final velocities in the field prior to printing.

Overlay (2, 1) - Entry STCS

Overlay (2, 1) contains the subroutines STALOO and BRHS to loop through the stations and calculate the coefficients B and RHS for the matrix solution of the streamline adjustment equation. Included also is the subroutine ADJWF which adjusts nozzle flow rates prior to entering the flow balance calculation.

Overlay (2, 2) - Entry STCW1
Overlay (2, 3) - Entry STCW2

These two overlays are loaded at the end of the problem solution to produce the printed output and generate a restart tape if requested. Subroutine WRIA prints the parameters defined by input, program storage utilization information, solution convergence level as well as generating the restart tape. Subroutines WRIØUT and WRIBDY print out the solution at the field points and the boundaries respectively.

Overlay (3, 0) - Entry STCXX

Overlay (3, 0) is loaded prior to the execution of the flow balance. The prime functions of this link are to adjust the streamline positions (ADJSL), refine the grid (REFINE), calculate streamline curvatures (SLC), orthogonalize the grid (PTMØVE), and calculate velocities on the far field boundary (FARFLD). The far field routines are only called if these options are in effect. REFINE will not be called if grid refinement limits have been reached, the flow balance error is too large, or the maximum field point limit has been met.

Overlay (4, 0) - Entry STCM

Overlay (4, 0) contains the subroutines MCØEF and IAD to set up and solve the matrix equations for the streamline adjustment.

Routines	Function	Output
REDINP	Read Input.	
BLDTAB BLDTBS BCONV	Build Tables and determine first crude calculation net.	Z, R, S2, V
SLC	Calculate distances between points along streamlines.	S1
REFINE	Refine grid by adding new orthogonals and streamlines as required.	Z, R of refined grid
SLC	Calculate streamline curvatures, angles, and distances between points. Locate stagnation points.	CURV, PHI1, S1
PTMOVE	Move points along streamlines to obtain orthogonal lines.	Z, R, CURV, PHI1, S1, S
FARFLD	Calculate velocities on the far field boundary.	UDN
ADJWF	Adjust nozzle flow rates.	
STALOO BRHS FLOBAL	Station loop to calculate coefficient B and RHS using "flow balance" equations.	B, RHS, ES2
MCOEF	Calculate matrix coefficients including far field B. C.	A1, A2,...A8
IAD	Solve matrix equations for streamline movement.	DS2
ADJSL	Adjust streamlines.	Z, R
WRIA WRIOUT WRIBDY	Print output.	
EXIT		

additional grid refinement if rough tolerance is satisfied

inner loop

if grid refinement and final tolerance are satisfied

Fig. 5-1 Program Flow Chart

STCA
MOVE
SETM
FMPYC
GETIX
IMSPRT
ATAN3
BARC
BEAM
BEND
BFI
LBF
LQC2
LSPFIT
LSUM
MBEGIN
QIREM
TABPRT
TAN
FHEAD
ERRORR
LFIT1
STANQ
STAX1
BOWXY
OLSHK
CPRINT
CFRFIN
CFRFLD
ALLCOM
CTHICK
CCURY
CRHS
CM
CB
CPHI1
CS1
CS2
CZ
CR
CVM
CDS2
CIDEX
CIDEXR
IXORIG
SLTAB
CHDATA
SLTAB2
CBEAM2
ERASE2
CPTMOVE
CINNER
CIADIN
CTABPR
CLINES
LINMAX
CTOLRL
CBOW
CBOWXY

1,0
STCN
ERROR1
ISORT
REDBLK
LRMDS1
DBSRT1
LOOP

1,1
STCNR
REDINP
RBD
CSMOOD
RCD
SMOTH
SMOINP
RELOXY
SERS1
XTRUNC
SMOXEQ
ATDMR
BAD
BFACES
SMOO
SMULTI

1,2
STCN2
BLDTAB
BPSORT
FFINIT
FRFDNZ
MATINV
ISBQT
TTPT

1,3
STCN3
BCONV
BLDTBS
BWAKE
FILL
JOFCHN
OBI
RBCONV

2,0
STCB
ERROR1
LFIT2D
TTPT
ADJWF2
FLOBAL
SHKPT

2,1
STCX
ADJWF
BRHS
NEWRAP
STALOO

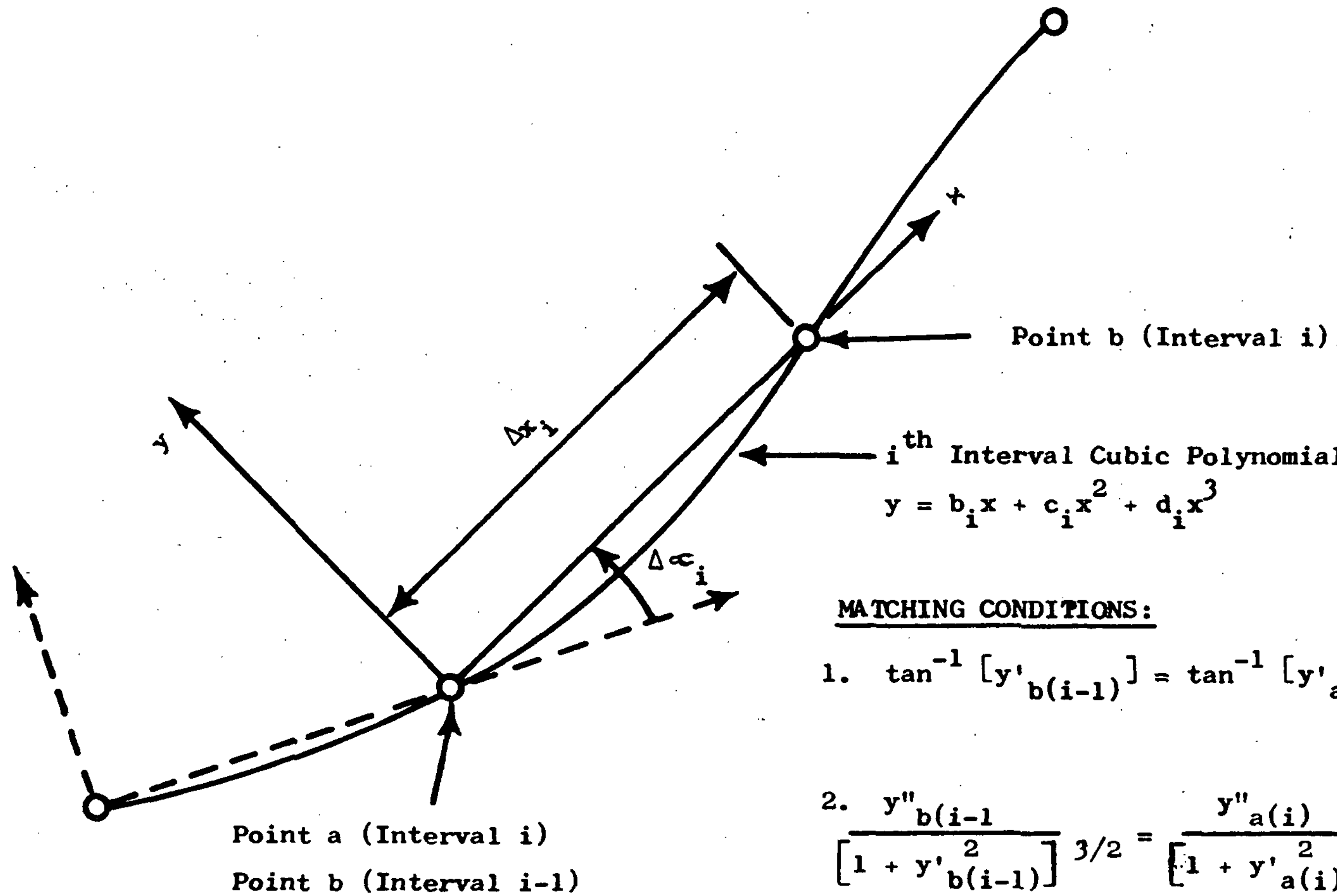
2,2
STCW1
WRIZ

2,3
STCW2
WRIOUT
WRIBDY

3,0
STCXX
ADDFPT
ADDFPT
ADJSL
ADPTSL
BDYPTM
BARCS
BF3
BFAC
BFACS
FARFLD
INSTA
PTMOVE
REFINE
SLC
SPC
SS5PTC
STTOFI
BOWSKI
INSHK

4,0
STCM
CA2-CA8
MCOEF
IAD
FFINC
ATDMRS
CUFITR
CUFIT
CUBE
CUBERS
CUBICS
S55PTI

Figure 5-2 STC Overlay Structure

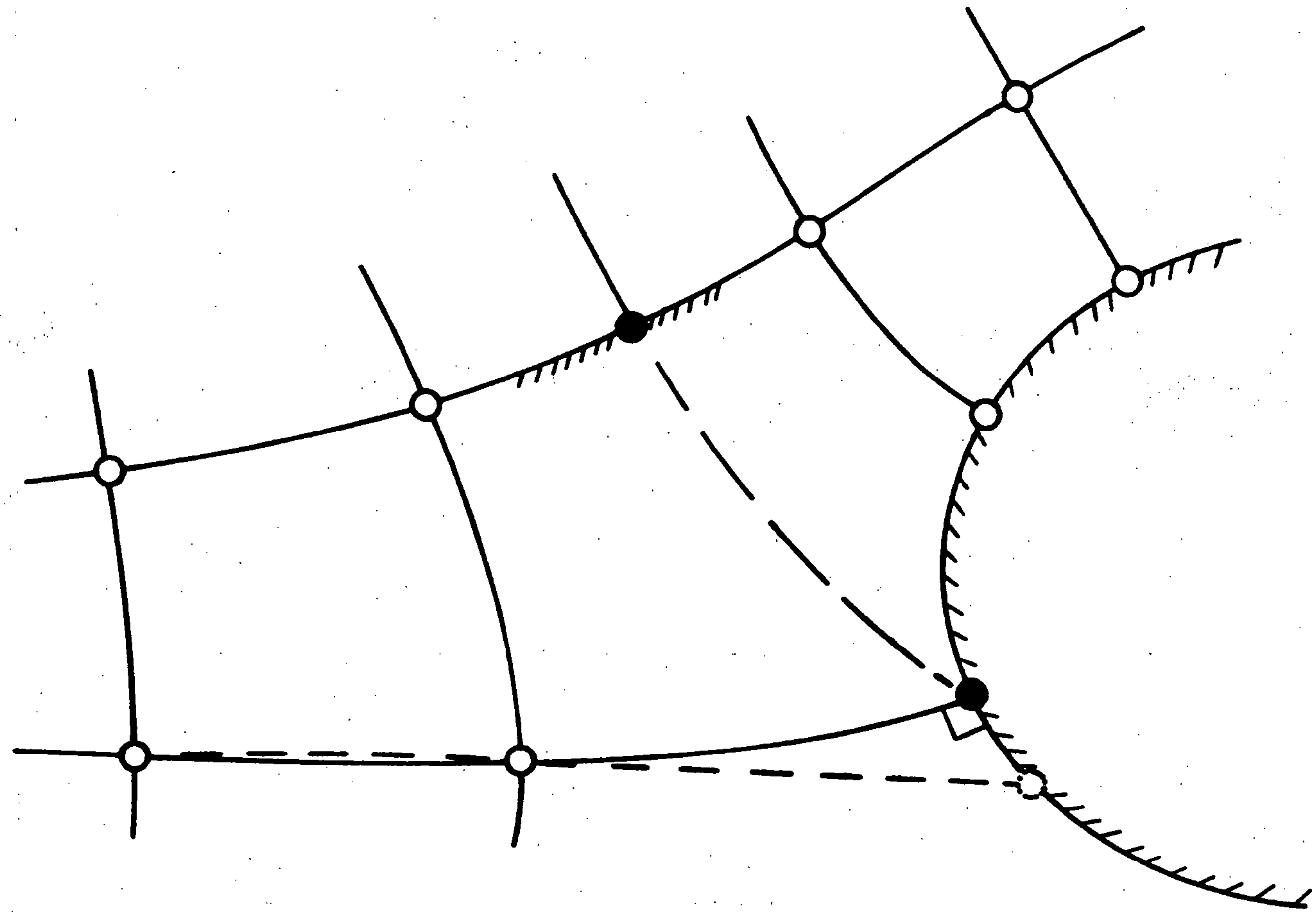


<u>MATCHING CONDITIONS:</u>

1. $\tan^{-1}\left[y'_{b(i-1)}\right] = \tan^{-1}\left[y'_{a(i)}\right] + \Delta\alpha_i$

2. $$\frac{y''_{b(i-1)}}{\left[1 + y'^{\,2}_{b(i-1)}\right]^{3/2}} = \frac{y''_{a(i)}}{\left[1 + y'^{\,2}_{a(i)}\right]^{3/2}}$$

Fig. 5-3 Curve Fit Algorithm



● Points Repositioned in the Streamline Curvature Calculation Routine

Fig. 5-4 Stagnation Point Iteration

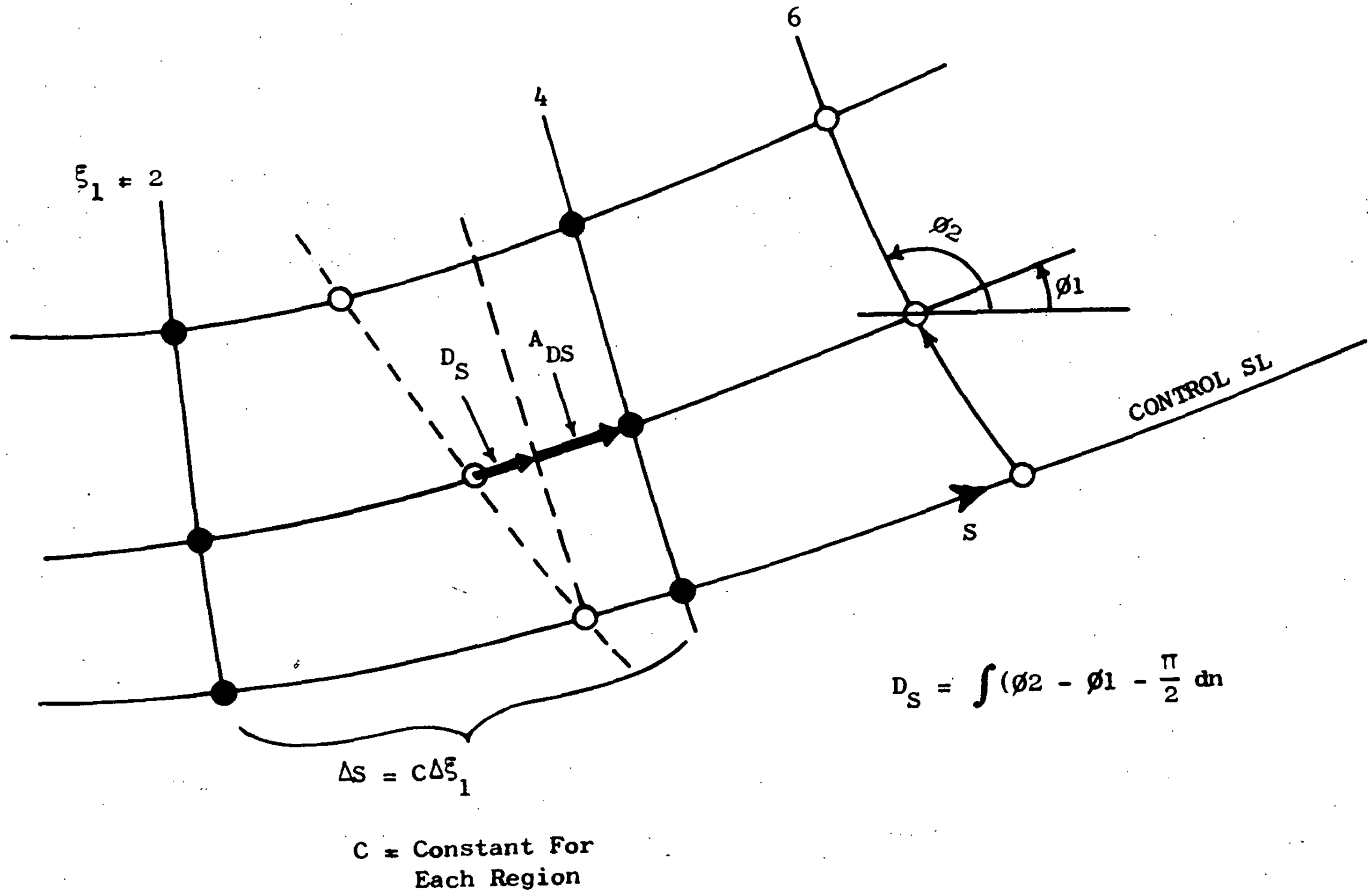


Fig. 5-5 General Positioning of The Orthogonals and Point Movement for Obtaining Lines
The Streamlines

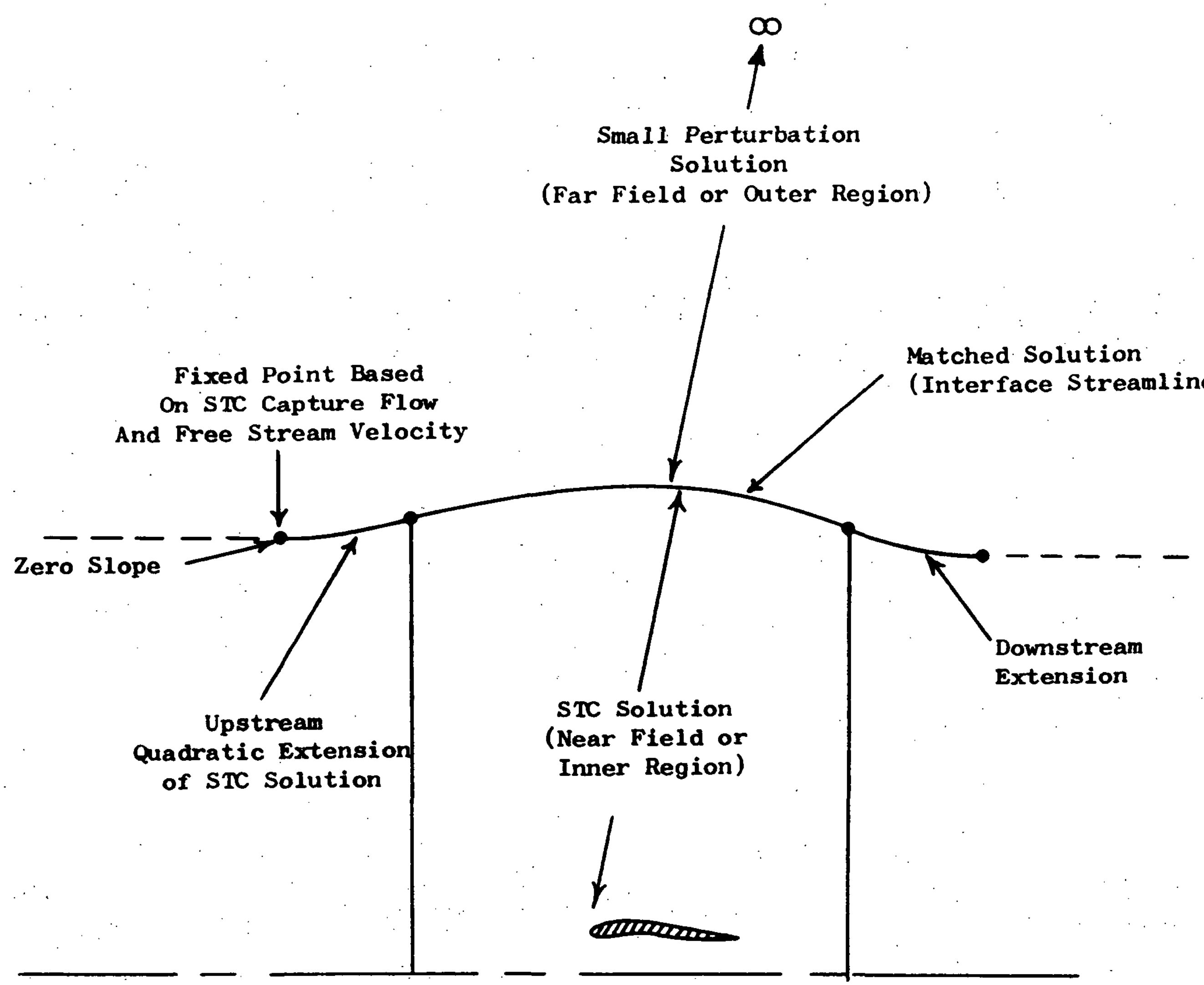


Fig. 5-6 Illustration of Far Field and Near Field Solution Domain

6.0 PROGRAM NOMENCLATURE

Communication between the subroutines in each overlay is accomplished by the use of labeled common. with few exceptions, the majority of labeled common storage areas are located in the main overlay. The size and data in these blocks are initialized by the block data subprograms USECDG and STCBLK. The principal labeled common blocks are given alphabetically in the following section. Labeled commons used by general purpose utility subroutines are not included in the tabulation. In most cases, the use of these commons is given in the listing of the pertinent subroutine (Volume III).

Within each block, variables are listed according to the position occupied in the block. In some cases, the variable name may differ between routines and a typical name is given. Also, several areas are used primarily as erasable temporary storage and are denoted as such in the description of the labeled common. Inspection of the source listing should indicate the particular use of these areas by a given subroutine. The pertinent dimension and type information are included with the variable name (R ≡ Real, I ≡ Integer, L ≡ Logical). Variables normally containing BCD data are typed as H ≡ Hollerith, even though they may have real or integer names.

Block Name	Typical Variable Names	Type	Dimensions	Description
ADAM01				Identification Block
	NAME	H	6	User name
	ADDRES	H	6	User address
	DUM	-	6	------------
	IDENT	H	6	Problem identification
ALLCOM				Contains reference Mach number, pressures, temperatures, gas properties
	MACHA	R	1	Reference Mach number (free stream)
	PSA	R	1	Reference static pressure
	TSA	R	1	Reference static temperature
	PTA	R	1	Reference total pressure
	TTA	R	1	Reference total temperature
	AXIA	L	1	Problem type; (T) axisymmetric, (F) plane
	RGA	R	1	Gas constant
	GAMA	R	1	Isentropic exponent
	DUM	-	10	
	TTE	R	1	Body closure tolerance
	CHOTST	L	1	Input indicator to perform (T) or omit (F) choke test when adjusting flow
BCOMMN				Program control common
	PROGM	H	1	Program name STC
	TAPIN	L	1	Input tape indicator (T)
	TAPOT	L	1	Output tape indicator (T)
	DUM	-	6	
	FILIN	L	1	Internal equivalents of TAPIN, TAPOT
	FILOT	L	1	

Block Name	Typical Variable Names	Type	Dimension	Description
CA2	A2	R	300	Curvature Influence Coefficient (MCOEF)
CA3	A3	R	300	Curvature Influence Coefficient (MCOEF)
CA4	A4	R	300	Influence Coefficient related to flow difference between steamlines (MCOEF)
CA5	A5	R	300	Curvature Influence Coefficient (MCOEF)
CA6	A6	R	300	Curvature Influence Coefficient (MCOEF)
CA7	A7	R	300	Influence Coefficient related to flow difference between streamlines (MCOEF)
CA8	A8	R	300	Influence Coefficient related to flow difference between streamlines (MCOEF)
CB	B	R	300	Coefficient B of Matrix Equation at field points
CBITS				General Common for junk words
	BITS	R	1	BITS = 1.E + 15
	BLANK	H	1	BLANK = 1H
CBDYPT				Angle and curvature of adjusted boundary point (PTMOVE)
	ANGD	R	1	Angle at adjusted boundary point
	CURVD	R	1	Curvature at adjusted boundary point

Block Name	Typical Variable Names	Type	Dimensions	Description
CCRX				Control common for insertion of orthogonals and streamlines during grid refinement
	CRXSL	R	1	New streamline extension
	CRXOL	R	1	New orthogonal lines across a subsonic region
	CRXSS	R	1	New orthogonal lines across a supersonic or mixed region
	CRXE	R	1	New orthogonal lines which cross a sonic line
	CRXC	R	1	New orthogonal lines which cross a supersonic to subsonic compression line
CCURV	CURV	R	300	Curvature at field points
CDS2	DS2	R	300	Streamline adjustment at field points
CFB				Flow Balance Communication Block
	L	I	1	Current station index
	MA	I	1	Lower boundary field point index
	MB	I	1	Upper boundary field point index
	WF	R	1	Flow rate if different from value in the streamline table
	PLB	R	1	Desired pressure on lower boundary (if known), otherwise = 0
	PUB	R	1	Desired pressure on upper boundary (if known), otherwise = 0

Block Name	Typical Variable Names	Type	Dimensions	Description
	CHOKE	L	1	= T for calculation of maximum (choked) flow
	SUBSON	L	1	= T for subsonic branch, = F for supersonic branch
	NK	I	1	Number of streamlines at given station (L)
	PLBC	R	1	Calculated lower boundary pressure
	PUBC	R	1	Calculated upper boundary pressure
	XCHOKE	R	1	BCD word SCHOKE
	TAREA	R	1	Total passage area for all streamtubes
	VMBC	R	1	Calculated velocity on upper boundary
	WRQST	R	1	Requested flow (from SLTAB)
	WCALC	R	1	Calculated flow
	QV	R	8	Flow balance iteration history vector
	QVP	R	8	Pressure balance iteration history vector
	JSUM	I	1	Indicator used for detecting a change in the channel
	VMLBSQ	R	1	Velocity squared on lower boundary

Block Name	Typical Variable Names	Type	Dimension	Description
CFRFIN				Far field initialization
	ATINF	R	1	Free stream stagnation speed of sound
	MINF	R	1	Free stream Mach number
	RFFREF	R	1	Reference (R,Y) location of far field
	UNIF	R	1	Free stream velocity
	ZDN1	R	1	Upstream limit of far field
	ZDN25	R	1	Downstream limit of far field
CFRFLD				Far field solution - communication
	NFF	I	1	No. of STC points on far field boundary
	MAXFF	I	1	Maximum No. of STC points on far field boundary
	ZFF	R	64	Streamwise coordinates of STC points on far field boundary
	RFF	R	64	Transverse coordinates of STC points on far field boundary
	ZDN	R	25	Streamwise coordinates for far field solution
	DRDN	R	25	Interpolated far field flow angles at ZDN

Block Name	Typical Variable Names	Type	Dimension	Description
	UDN	R	25	Calculated velocity on far field boundary @ ZDN
	ZIJ	R	25,25	Zij matriz for far field solution
GGRAV				
	CG	R	1	CG = 32.174 ft - $lbm/lb_f\ sec^2$
CHDATA				CHDATA contains the STC tables described in Section 5.1
CIADIN				Control Common for matrix solution
	RHOBAS	R	1	Base acceleration factor, ρ_B
	RHOAMP	R	1	Half amplitude of the acceleration factor, ρ_A
	IADM	I	1	Sweep parameter, = 0 for IAD = 1 for orthogonal block relaxation =-1 for streamline block relaxation
CIDEX				Communication common used by GETIX and SAVIX to store and retrieve data from JMS array
	M	I	1	Current field point index
	J	I	1	Streamline number
	MU	I	1	Field index of upstream point
	MD	I	1	Field index of downstream point

Block Name	Typical Variable Names	Type	Dimension	Description
	ISTAG	I	1	Point type indicator 0 - Normal point 1 - Stagnation point 2 - Primary orthogonal 3 - Partial orthogonal termination
CIDEXR				Communication used by GETRLX to retrieve data from the JMS array
	M	I	1	Current field index
	DUM	-	4	
	M3	I	1	Field index of point upstream of M (ISTAG = 3 points skipped)
	DUM	-	4	
	M5	I	1	Field index of point downstream of M (ISTAG = 3 points skipped)
	DUM	-	4	
	M2	I	1	Field index of point upstream of M3 (ISTAG = 3 points skipped)
	DUM	-	4	
	M6	I	1	Field index of point downstream of M5 (ISTAG = 3 points skipped)
	DUM	-	4	

Block Name	Typical Variable Names	Type	Dimension	Description
CINNER				Control Common for inner iterations
	INRCTR	I	1	Counter for inner iterations (set to 0 when grid is refined)
	DUM	-	1	
	NINNER	I	16	Number of inner iterations at a given refinement level. Inner iterations continue until INRCTR = NINNER(MAJCTR) or ES2MX ≤ ES2LIM
	CNVF	R	16	Fractional-percentage of total point movement to be used at a given refinement level (0. < CNVF(MAJCTR) ≤ 1.)
CISBOT				Common for special boundary types
	FARFLD	H	2	Boundary names specified as far field boundaries
	FREE	H	2	Boundary names specified as free streamlines
	PRES	H	2	Boundary names where pressure is specified
	DUM	-	1	
	NZP	I	1	No. of entries in ZP, PPS tables
	ZP	R	10	Table of Z(X) values for interpolation of pressure on boundaries where pressure is specified
	PPS	R	(10)	Table of pressures PPS (ZP)
	DUM	-	2	

Block Name	Typical Variable Names	Type	Dimension	Description
	ADUM	R	6	Additional storage for special boundary information ADUM(1) = fractional extension of far field in streamwise direction; ADUM(2-6) not used
CM	JMS	I	1	Table of packed words containing pointers to field tables
CMAXIT				Control common for grid refinement levels
	MAXIT	I	1	Maximum number of grid refinement
	MAJCTR	I	1	Current refinement level
	GREFIN	L	1	Indicator set by subroutine REFINE to indicate that a grid refinement has occurred (T)
	DUM	-	1	
CPHI1	PHI1	R	300	Flow angle at field points (radians)
CPI				Table of constants
	PI	R	1	PI = π = 3.14159265
	TWOPI	R	1	2 * PI
	PIQ2	R	1	PI/2
	PIQ4	R	1	PI/4
	TODEG	R	1	TODEG = 57.2957795 deg/radian

Block Name	Typical Variable Names	Type	Dimension	Description
	TORAD	R	1	TORAD = .0174532925 radians/deg
CPRINT				Diagnostic print and control array
	PRTES2	R	1	
	PRTB	R	1	
	PRTA	R	1	Variables in this common will be described in Section VII A. - Program Input
	PREFIN	R	1	
	PREFIN2	R	1	
	SSONIC	R	1	
	PDUM	R	20	
CPRPRN				Print control for field (WRIOUT)
	PRPRN	I	1	PRPRN = -1 Field printout at each station deleted
CR	R	R	300	Transverse coordinate (R,Y) at field points
CREFIN				Grid refinement control
	DUM	-	2	

Block Name	Typical Variable Names	Type	Dimension	Description
	VMG1	R	1	Maximum Mach number increment between grid points in streamwise direction
	VMG2	R	1	Maximum Mach number increment between grid points in normal direction
	NGR	I	1	No. of entries in GR, SGR tables
	NGZ	I	1	No. of entries in GZ, SGZ tables
	GR	R	10	Grid radius
	SGR	R	10	Grid size in radial direction
	GZ	R	10	Streamwise grid distance
	SGZ	R	10	Grid size in axial direction
CRHS	RHS	R	300	Right hand side of matrix equation at field points
CS1	S1	R	300	Cumulative distance along streamline at field points
CS2	S2	R	300	Cumulative distance along orthogonal line at field points
CSS				Supersonic Calculation Control
	SSFML	I	1	Supersonic curvature formula number
	SSEF	L	1	Supersonic entering flow, T or F

Block Name	Typical Variable Names	Type	Dimension	Description
	SSEANG	R	1	Entering flow angle for SSEF = T (Degrees)
	SSDF	L	1	Supersonic discharge flow (T or F)
	SSFEND	R	1	supersonic beam downstream end condition
	SSFND1	R	1	Supersonic beam upstream end condition
	SSDLE	L	1	Supersonic flow below and aft of a leading edge point (T or F)
	A4FACT			
	BRLX			
	CURRLX			
CTOLRL				Solution tolerance, sweep control
	TOLRL	R	1	Tolerance on matrix solution relative to maximum streamline movement
	MAXSWP	I	1	Sweep limit for relaxation solution of matrix equation
	CLEN	R	1	Characteristic grid size
	DS2MX	R	1	Maximum streamline movement

Block Name	Typical Variable Names	Type	Dimension	Description
	TOLES2	R	1	Relative tolerance on point movement predicted by flow balance
	NSWP	I	1	Number of sweeps required for convergence of matrix solution
	DS1	R	1	Damping factor on point movement along streamlines
	DS1MXA	R	1	Maximum point movement along streamlines
	DS1MXB	R	1	Maximum calculated point movement along streamlines before damping
	DS1RMS	R	1	RMS value of the calculated point movements along streamlines
	ES2MAX	R	1	Maximum streamline position error as determined by flow balance
	DS1RMO	R	1	RMS value of the calculated point movements along streamlines after grid refinement
	SG1MIN	R	1	Minimum grid size as determined by REFINE
	TOLINR	R	1	Inner iteration tolerance on streamline movement
CVM	VM	R	300	Velocity at field points
CZ	Z	R	300	Streamwise coordinate at field points
ERASE			800	
ERASE2			1536	Temporary storage areas
ERASE3			2036	

Block Name	Typical Variable Names	Type	Dimension	Description
IXORIG				Table of Index Limits
	LHO	I	1	Lower index limit for channel input table (CHDATA)
	LHE	I	1	Upper index limit for channel input table (CHDATA)
	LBDO	I	1	Lower index limit for boundary table (CHDATA)
	LBDE	I	1	Upper index limit for boundary table (CHDATA)
	LTO	I	1	Lower index limit for convected property table (CHDATA)
	LTE	I	1	Upper index limit for convected property table (CHDATA)
	LWO	I	1	Lower index limit for wake table (CHDATA)
	LWE	I	1	Upper index limit for wake table (CHDATA)
	LFO	I	1	Lower index limit for flow adjustment table (CHDATA)
	LFE	I	1	Upper index limit for flow adjustment table (CHDATA)
	LO	I	1	Lower index limit for station table (CHDATA)
	LESTA	I	1	Upper index limit for station table (CHDATA)
	LSO	I	1	Lower index limit for shock table (CHDATA)
	LSE	I	1	Upper index limit for shock table (CHDATA)
	LDUM	I	6	Dummy - future growth
	MO	I	1	Initial point in field tables
	NM	I	1	Number of field points
	NJ	I	1	Number of streamlines
	NFCOLS	I	1	

Block Name	Typical Variable Names	Type	Dimension	Description
	MAXNJ	I	1	Maximum number of streamlines
	MAXOL	I	1	Maximum number of orthogonals
	MAXNM	I	1	Maximum number of field points
	MAXLE	I	1	Maximum number of leading edge/trailing edge points
	LEO	I	1	Lower index limit for leading edge/trailing edge table
	LEE	I	1	Upper index limit for leading edge/trailing edge table
	LRO	I	1	Lower index limit for orthogonal/channel table
	LRE	I	1	Upper index limit for orthogonal/channel table
	LRD	I	1	No. of channels +1
LETEPT				Table of leading edge/trailing edge points
	XE	R	1	Streamwise coordinate
	YE	R	1	Transverse coordinate
	ANGE	R	1	Angle
	NLE	I	1	No. of leading edge coincident points
	NTE	I	1	No. of trailing edge coincident points
	CHL	H	1	Channel name below point
	CHU	H	1	Channel name above point
	BDL	H	1	Lower boundary name associated with point
	BDU	H	1	Upper boundary name associated with point
	NUSED	-	491	Additional tables having the preceding format

Block Name	Typical Variable Names	Type	Dimension	Description
MOMFLX				Storage for momentum flux calculation (channel) (WRIOUT)
	STXU	R	128	Entering channel axial momentum flux
	STXD	R	128	Leaving channel axial momentum flux
	STYU	R	128	Entering channel normal momentum flux
	STYD	R	128	Leaving channel normal momentum flux
SELECT				Communication common between main overlay and primary overlays
	LENTRY	I	1	Select key for different entries
SLTAB				Streamline table
	W	R	128	Flow rate
	X2	R	128	ξ_2 coordinate
	SLCHN	H	128	Channel name
SLTAB2				
	PTR	R	128	Total pressure ratio

7.0 STC PROGRAM INPUT/OUTPUT

The following sections are concerned with the input to the STC program, special user instructions, and the output produced by the STC program. The standard system files INPUT and OUTPUT (TAPE6 = OUTPUT) are used for card input and printed output respectively. Additional data files designated as TAPE1 (input) and TAPE2 (output) may be used by the programs. In general, these files will reside on magnetic tape.

7.1 Program Input

Input sheets for the STC program are given in Section 12.0, along with special notes pertinent to the use of these sheets. Optional program input, not normally required, will be described in this section. Input data may be in the form of punched cards or a magnetic tape file (output file from a previous execution of the STC program). Data read from a magnetic tape file may be selectively over-ridden or augmented by input cards. Four (4) distinct card input sets are read by the program and are:

1.)	Input sheet 0	Identification information
2.)	Input sheet 1	Overall input data
3.)	Input sheet 2	Boundary coordinates
4.)	Input sheet 3	Channel flow properties

The first input set, consisting of identification information, is read once in a given run using fixed field format (6A10). The remaining input sets consist of a header card followed by a NAMELIST input list $A. Standard FORTRAN IV NAMELIST (Volume III) is used to read these latter lists. Successive cases may be run using only input sets 2.) through 4.). In all cases, the channel flow properties (input set 4) may or may not be present.

The input parameters for each set are given in the following section. Included in these descriptions are the input items appearing on the input sheets as well as controls for special program options and the modification of preset tolerances.

7.1.1 Identification Information Input Sheet 0

The first three (3) cards of the input deck consist of the name and address of the user and the problem identification.

Card No.	Cols.	
1	2-61	User name (1-60 alphanumeric characters)
2	2-61	User address or location (1-60 alphanumeric characters)
3	2-61	Problem identification (1-60 alphanumeric characters)

Blank cards may be substituted for input quantities not required.

7.1.2 Overall Input Data Input Sheet 1

The first card of this input set is a header card consisting of a 1 in column 2, the word STC starting in column 4, and a T or an F in both columns 14 and 24.

Card Column	Description
2	1 - Denotes overall data input
4-6	STC - Denotes program name
14	Input tape? (T or F)
24	Output tape? (T or F)

The header card is followed by the NAMELIST $A and the associated overall input data. The NAMELIST input is terminated with a $ in column 2.

Input Parameters for General Usage

Parameter	Description	Preset Value
MACHO	Mach Number	
TSO	Ambient Temperature	1.0
PSO	Ambient Pressure	1.0
RG	Gas Constant	1.0
GAM	Ratio of Specific Heats	1.4
RHL	Highlight Radius	1.0

Parameter	Description	Preset Value
RM	Maximum Body Radius	1.0
TTE	Body Closure Tolerance	0.
AXI	Problem Type T = Axisymmetric F = Plannar	T
GR(1)	Table of Transverse Coordinates for Grid Refinement Tables (up to 10 values)	
SGR(1)	Table of Transverse Grid Refinement Criteria (up to 10 values)	1.
NGR	Number of Entries in the GR, SGR tables	1
GZ(1)	Table of Axial Coordinate for grid Refinement Tables (up to 10 values)	
SGZ(1)	Table of Axial Grid Refinement Criteria (up to 10 values)	
NGZ	Number of entries in the GZ, SGZ tables.	0
VMG1	Maximum Mach Number Increment Between Grid Points in Streamwise Direction	0.1
VMG2	Maximum Mach Number Increment Between Grid Points in Normal Direction	0.1
MAXIT	Maximum Number of Grid Refinements	

Optional Input

The following input quantities are considered optional input in that they are not normally required for execution of the STC program. These items consist, in general, of input controls for special program options and input data to modify preset or initialized constants and parameters.

Stagnation Properties, Optional

Parameter	Description	Preset Value
PTO	Stagnation pressure	1.0
TTO	Stagnation temperature	1.0

The total pressure and total temperature may be input by specifying PTO and TTO normalized by the free stream static temperature and pressure. Alternately, the total conditions are calculated from the Mach number, MACHO, and the ambient pressure and temperature, PSO and TSO.

Special Controls for Supersonic Flow, Optional

Parameter	Description	Preset Value
SSFML	Formula number for calculation of supersonic curvatures = 1 for 3 point parabola = 2 for 4 point piecewise cubic (i.e. beam) = -1 for 3 point parabolas for both subsonic and supersonic points	1
SSEF	Supersonic entering flow along the upstream boundaries? T or F	F
SSEANG	Entering flow angle for SSEF = T (degrees)	0.
SSDF	Supersonic flow downstream of a choked station? T or F	F
SSFEND	Supersonic beam downstream end condition (SSFML = 2) 0. = Parabola 1. = Cubic	.75
SSFND1	Supersonic beam upstream end condition (SSFML = 2) 0. = Parabola 1. = Cubic	.75
BRLX	B - Relaxation factor	1.
TSIC	Number of points to be used for transonic interpolation of curvature	2.

Boundary Conditions for Streamline End Points, Optional

Parameter	Description	Preset Value
NBC	NBC(1) ≡ Upstream, NBC(2) ≡ Downstream; NBC = 0 Angle specified NBC = 1 Curvature specified NBC = 2 Ratio of the rate of curvature at the end point to the value at the next end point is specified	2
AFC	AFC(1) ≡ Upstream, AFC(2) ≡ Downstream; Angle, curvature or ratio of rate of change in curvatures	0.

Matrix Solution Controls, Optional

Parameter	Description	Preset Value
IADM	Sweep parameter 0 = IAD 1 = Orthogonal block relaxation -1 = Streamline block relaxation	0
RHOBAS	Base acceleration factor parameter, ρ_B	0.5
RHOAMP	Half amplitude of the acceleration factor, ρ_A Note: $\rho = \rho_B + 2\rho_A \sin^2 \frac{n\pi}{2\sqrt{NM}}$	0.5
MAXSWP	Maximum number of sweeps	200
TOLRL	Relative tolerance for matrix solution; $\lvert \Delta DS2 \rvert \leq TOLRL*DS2_{max}$.	.001

Flow Balance Solution Controls, Optional

Parameter	Description	Preset Value
TOLES2	Relative tolerance on maximum point movement predicted by the flow balance	
TOLINR	Inner iteration tolerance on streamline movement	
NINNER(1)	Number of inner iterations (without grid refinement). Specify up to MAXIT values	16*10
CNVF(1)	Fractional percentage of total point movement to be used at a given refinement level. Specify up to MAXIT values.	10*1.0
NODENS	Grid refinement level through which incompressible flow properties ($\gamma=\infty$) will be assumed.	0

Grid Refinement Parameters, Optional

The following input items may be used to control the length of orthogonal lines and streamlines as the grid is refined. The use of these parameters is discussed in the following section on "special user instructions".

Parameter	Description	Preset Value
CRXSL	Used for extending new streamlines	.375
CRXOL	Used for extending new orthogonal lines across a subsonic region	.375
CRXSS	Used for extending new orthogonal lines across a supersonic or mixed region	.125
CRXE	Used for extending new orthogonal lines which cross an expanding flow sonic line	0
CRXC	Used for extending new orthogonal lines which cross a supersonic to subsonic compression line	0

Optional Print and Control Options

Optional diagnostic print and special logic controls are located in common /CPRINT/. Normally these variables are set to 0.. As indicated in the following section, the print controls will provide output from a number of routines. The setting, pertinent subroutine, and resulting printout are indicated. Several variables control logic flow only.

Parameter	Description
PRTES2	Subroutine BRHS =2 Print B,RHS,DS2,Z,R,PHI,CURV, and ES2 for the two stations with maximum ES2. (DS2 is the value computed during the previous iteration.) >2 Print the above information for PDUM(8) $\leq \xi_1 \leq$ PRTES2. (B,RHS and DS2 are the values computed during the previous iteration.)

PRTA	<u>Subroutine IAD</u>
	$\neq 0$ Print matrix solution for DS2 at end of each sweep. This indicator is turned on internally if NSWP > MAXSWP - $\sqrt{NM}$ - 2
PREFIN	<u>Subroutine REFINE</u>
	$\neq 0$ Print diagnostic during streamline refinement for PDUM(8) $\leq \xi_2 \leq$ PREFIN
PREFN2	<u>Subroutine REFINE</u>
	$\neq 0$ Print diagnostic during orthogonal line refinement for PDUM(8) $\leq \xi_1 \leq$ PREFN2
SSONIC	<u>Subroutine BRHS</u>
	=2 Suppress area scaling for ES2 calculation
PDUM(1)	<u>Subroutine SLC</u>
	≥ 1 Print ZB,RB,ANGD,CURVD during iteration for stagnation point location
	=1 Print results of curvature calculation
	=2 Print results of supersonic curvature calculation
	=4 Print curvature results if point is a stagnation point or the termination of a partial orthogonal
PDUM(2)	<u>Subroutine IAD</u>
	$\neq 0$ Print final matrix solution for DS2
PDUM(3)	<u>Subroutine MCOEF</u>
	$\neq 0$ Print influence coefficients $A_2, \ldots A_8$
PDUM(5)	<u>Subroutine MCOEF</u>
	≥ 1 Print influence coefficients, G, relating streamline point movement to the negative of curvature
	=3 Print above information for partial orthogonal points only
	=4,5 Print above information for 1st and 2nd points upstream of leading edge
PDUM(6)	<u>Subroutine ADJWF</u>
	$\neq 0$ Print results of flow adjustment iteration

Parameter	Description
PDUM(7)	Subroutine REFINE $\neq 0$ Print velocities, stream-function after refinement
PDUM(8-9)	Subroutine FLOBAL Print flow balance related data if PDUM(8) $\leq \xi_1 \leq$ PDUM(9) and PDUM(8)*PDUM(9) $\neq$ 0
PDUM(10)	Subroutine BUILDT $\neq 0$ for printout of tables described in Section 5.1 after they are first constructed =2 for printout of all tables at end of solution
PDUM(11)	Subroutine FARFLD $\neq 0$ Print coordinates, slope, velocity on the far field boundary
PDUM(12)	Subroutine MCOFF $\neq 0$ Use spline influence coefficients even if SSFML = -1
PDUM(13	Subroutine FARFLD $\neq 0$ Use "linear" interpolation on the far field boundary $\neq 0$ Use "least squares parabolic" interpolation on the far field boundary
PDUM(18)	Subroutine FLOBAL =1 for calculation of normal shock total pressure loss for transonic compressions
PDUM(20)	Subroutine FRFDNZ $\neq 0$ Print matrices used in far field solution
PRPRN	Subroutine WRIOUT $\neq -1$ Print field information at each station

7.1.3 Boundary Coordinates — Input Sheet 2

The first card of this input set is a header card containing a 2 in column 2, the word BDY starting in column 4, the boundary name in column 14, and the channel name in column 24.

Card Column	Description
2	2 - Denotes boundary input
4	BDY - Denotes input type
14	Boundary name, 1-6 alphanumeric characters
24	Channel name, 1-6 alphanumeric characters

The header card is followed by the NAMELIST $A and the associated input for the specified boundary. The NAMELIST is terminated with a $ in column 2.

Parameter	Description	
UPPER	Boundary position	
	UPPER = T	Upper boundary
	UPPER = F	Lower boundary
ZRONLY	Geometry indicator	
	ZRONLY = T	No surface angle input
	ZRONLY = F	Surface angle input

Two options are available for the input of the boundary geometry. Either the coordinates and the surface angle (measured from the positive x-axis) may be input, or the coordinates alone may be input. In either case the points must be input accurately. The first option (ZRONLY = F) is preferred. With the second option (ZRONLY = T), a beam is fit to the input points to determine the angles and, in the process, the beam fit angles and curvatures are printed. To determine whether a suitably smooth curve has been fitted to the points, the user should examine the curvatures and make sure they are reasonable. In general, the points should not be closely spaced except as required in regions of high curvature. In these regions, the angle change between points should be less than 25 degrees.

The NACA Series 1 cowl coordinates are stored internally, and may be selected by specifying ZRONLY = T and B(1) = 991, 1, followed by the highlight coordinates and the coordinates of the maximum diameter. If the cowl is to be extended beyond the end of the Series 1 contour, the "maximum diameter" coordinate is repeated and then other coordinates are listed.

Boundary coordinates are normally input in tabular form using the B block as specified on input sheet 2. All points must be listed in the streamwise direction for each boundary. Points at sharp corners must be listed twice, once for each angle which exists at the point. Normally, pressure and Mach number distributions will be printed at each orthogonal intersection with the boundary. Orthogonals may be forced to coincide with boundary points by listing the point twice in the input and setting DBLPTS = 0. (see optional boundary input).

The column names in the B arrary are Z (or X), R (or Y), and ANGD.

Parameter	Description
B(1)	Input block for boundary data
	column 1 Z or X coordinate
	column 2 R or Y coordinate
	column 3 Angle or slope of surface

If desired, the data in the B array may be input in "free form" using the symbolic names associated with the appropriate columns of the B block.

Parameter	Description
R	Normal (radial) coordinate (axisymmetric)
Y	Normal (vertical) coordinate (Planar)
Z	Axial coordinate (axisymmetric)
X	Axial coordinate (planar)
ANGD	Angle or slope of surface

Boundary data input via the B block will override corresponding data input in the "free form".

Optional Input

Optional input parameters, not shown on input sheet 2, are available to apply linear transformations to the input coordinates. Also, input control may be specified to force orthogonals to be placed at selected boundary input

points. This is accomplished by repeating the coordinates in the boundary input and specifying DBLPTS = 0. Normally, DBLPTS = .01 forces removal of extra orthogonal stations where the angle discontinuity is less than .01 degrees.

Parameter	Description	Preset Value
DBLPTS	Double point tolerance. Double points will be deleted if the angle discontinuity is < DBLPTS (degrees)	0.01
ROTATE	Angular rotation in degrees	
ZPIVOT RPIVOT	Coordinates of the pivot point of rotation	
SCALE	Multiplicative constant to be applied to the coordinate data	
ZTRANS	Translation increment in axial direction	
RTRANS	Translation increment in radial/vertical direction	

7.1.4 Channel Flow Properties — Input Sheet 3

The first card of this input set is a header card containing a 3 in column 2, the word CHN starting in column 4, and the channel name starting in column 14.

Card Column	Description
3	3 - Denotes channel input
4	CHN - Denotes input type
14	Channel name, 1-6 alphanumeric characters

Channel flow properties are specified in the following NAMELIST A, which is terminated with a $.

Parameter	Description	Preset Value
GAM	Ratio of specific heats	1.4
RG	Gas constant	1.0
TTO	Total temperature normalized by freee stream static temperature	
PTO	Total pressure normalized by free stream static pressure	
MACHO	Mach number	
TSO	Static temperature normalized by free stream static temperature	1.0
PSO	Static pressure normalized by free stream static pressure	1.0

Specify either TTO and PTO (if known) or MACHO, TSO, and PSO if the Mach number is known. When these options are not used, the second option is employed with the free stream values of PTO and TTO computed from the MACHO supplied in the overall input data (sheet-1).

Parameter	Description	Preset Value
AO	Nondimensional flow area normalized by the product of π and the square of the highlight dimension. For plane cases input $\Delta Y_o/\Delta Y_{HL}$. For inlets AO $\simeq$ mass flow ratio.	

The flow is computed using the total properties as determined from the supplied Mach number, MACHO, and the flow area AO. If input data are not supplied for a given channel, the reference properties on input sheet-1 will be employed with the area calculated at the entrance station.

Individual sets of boundary and channel data need not be input in any particular order. For example, boundary input for the upper and lower surfaces bounding a given channel (input sheet 2) may be followed by the input for the pertinent channel (input sheet 3). While arbitrary placement of these input sets may be used, it is well to develop some standardized conventions for the sequential input of boundaries and channels. This will be discussed further in the following section on special user instructions.

7.2 Program Output

The output from the STC program may be logically divided into the following six sections:

1.) Card input and preliminary printout.

2.) Input and calculated boundary coordinates and angles.

3.) Solution history

4.) General input and output data

5.) Flow field data along orthogonal lines

6.) Calculated flow data along field boundaries and final channel momentum balances.

The above sections appear sequentially in the output except when PRPRN = -1. In this case, the print of the flow field data along orthogonal lines is eliminated and the calculated boundary information follows the general input/output section.

7.2.1 Card Input and Preliminary Printout

The initial section of output consists of a card image print of the problem input and a designation of the tape input/output file selections; viz, TAPIN = $\genfrac{}{}{0pt}{}{T}{\underline{F}}$ and TAPOT = $\genfrac{}{}{0pt}{}{T}{\underline{F}}$. Upon completion of the card image print, the file TAPE5 is rewound to its original position.

7.2.2 Input & Calculated Boundary Coordinates & Angles

Boundary coordinates are processed and printed as they are read. The columnar output displayed for each boundary consists of the input coordinates (X,Z), (Y,R) and the input or calculated body slope (ANGD) in degrees. Preceding these items is a bold heading specifying BOUNDARY COORDINATES, the boundary name (BDY = name), the adjacent channel (CHN = name), and whether the surface is an upper (UPPER = T) or a lower (UPPER = F) boundary. When the ZRONLY = T option is in effect, intermediate printout will be produced defining the results of the beam curve fit to the input coordinates. Since no smoothing is applied to these coordinates, the only meaningful output is

the (X,Z) (Y,R) and the calculated angles (ANGD). Break points in boundaries (double points) enable the curve fit of a boundary in segments. The consolidated output, consisting of the collated boundary data for all segments, follows the above intermediate printout. The NACA Series 1 cowl coordinates (ZRONLY = T) appear as 40 points in a form similar to that described previously.

Normally, the solution history (described in Section 7.2.3) is printed as the next section of output. When far-field boundary conditions are applied, however, a comment is inserted in the output designating the original transverse location and streamwise extent of the far field boundary. Prior to calculation, the upstream and downstream limits of the far field streamline are extended to insure that the velocities are well behaved at the streamwise ends of the STC integration region. The coordinates of the resulting far field boundary are printed below the above comment.

7.2.3 Solution History

The solution history output provides a convenient summary of the problem history as the solution proceeds through major grid refinements and inner iterative improvements of the flow balance. Included in this section are the parameters defining the grid refinement, the inner iterations, the grid othogonalization, the flow balance errors, and the matrix solution. The pertinent variables in their literal order of appearance in the solution history list are:

Variable	Description
NREFIN	Grid refinement level
GRID PTS	Number of field points
INRCTR	Inner (flow balance) iteration level
CNVF	Convergence factor on streamline movement
RMS-DS1	Root mean square point movement along streamline before damping
MAX-DS1	Maximum point movement along streamline before damping
MAX-DS1	Maximum point movement along streamline after damping

Variable	Description
LIM-ES2	Limiting streamline ES2 for satisfactory solution of the flow balance
MAX-ES2	Maximum ES2 predicted by flow balance
MAX-DS2	Maximum streamline correction predicted by the matrix solution for DS2. = 0. when INRCTR = 0
NSWEEPS	Number of iterative sweeps for solution of the matrix equations. = 0 when INRCTR = 0

7.2.4 General Input and Output Data

The output in this section consists of general input and a summary of selected output parameters. All of these items have been defined previously in Sections 7.1 and 6.0, hence only the general subdivisions of this printout will be listed.

a.) General Input — Section 7.1

b.) Streamline End Conditions — Section 6.0

c.) Supersonic Curvature Parameters — Section 6.0

d.) Subsonic/Supersonic Branch Selection — Section 6.0

e.) Grid Size Criteria — Section 7.1

f.) Memory Utilization

The memory usage in terms of field points, STC table storage, and number of streamlines is compared with the maximum available values of these parameters.

g.) Convergence Data — Section 7.1

h.) Special Boundary Options

The GE version of STC contains a number of special boundary options in addition to the hard wall and the far field. Only the hard wall and far field have been explicitly implemented in the NASA Langley version of STC, due to limitations on the hollerith input capabilities of CDC NAMELIST input.

i.) Matrix Solution — Section 6.0

j.)	Contents of Channel Input Table	Section 6.0
k.)	Channel Flow Rates, Pressures and Temperatures	

Included in this output are the channel flow rates and the pressures and temperatures in each individual channel. Note that the flow rate in a given channel may be adjusted to satisfy the Kutta condition at a trailing edge. When dimensional properties are input, the columns denoted PT/PSO and TT/TSO have units compatible with the dimensions of the input gas constant RG.

7.2.5 Flow Field Data Along Orthogonal Lines

Flow field data on orthogonal lines are printed when PRPRN $\neq -1$. The first portion of output on each page consists of the program name (STREAMTUBE CURVATURE PROGRAM) and the problem identification. The STC program uses an auxiliary coordinate system (ξ_1, ξ_2) as a numbering scheme for orthogonal lines and streamlines. The coordinates ξ_1 = XI1 and ξ_2 = XI2 apply to the orthogonal lines and streamlines respectively. Following the problem identification is a heading with the constant station value ξ_1 = XI1 along with the channels through which the given orthogonal passes. Primary (initial) orthogonals are flagged with ** after ξ_1. At the extreme right of this line of output is the flow type; viz., SUB = subsonic, SUP = supersonic, or CHOKE = choked. Pertinent data from the field arrays are printed in column format. Stagnation points do not appear in the flow field output.

Variable	Description
XI2	Streamline numbering coordinate ξ_2
STRM FNCT	Dimensionless stream function; fraction of flow in channel
X, Z	Streamwise coordinate
Y, R	Transverse or cross stream coordinate
PHI	Flow angle, deg.

Variable	Description
CURV	Streamline curvature
PS/PO	Ratio of local static pressure to reference static pressure
PS/PT	Local static to total pressure ratio
TS/TT	Local static to total temperature ratio
CP	Pressure coefficient
	$\dfrac{P_s - P_\infty}{\frac{1}{2}\gamma P_\infty M_\infty^2}$ Compressible
	$\dfrac{P_s - P_\infty}{P_\infty M_\infty^2}$ Constant density ($\gamma = 0$)
	0 MACHA $\leq$ .1
MACH	Mach number
AREA	Flow area
PTQPTO	Channel total pressure ratio

For primary orthogonals, the axial and normal momentum fluxes are printed following the field data. These items are:

$$\text{Axial Momentum Flux} = \int V \cos\phi \, dw + \int (P-P_s) \cos\phi \, dA$$

$$\text{Normal Momentum Flux} = \int V \sin\phi \, dw + \int (P-P_s) \sin\phi \, dA$$

7.2.6 Calculated Flow Data Along Field Boundaries-Final Channel Momentum Balances

The final section of standard output includes the flow parameters on the upper and lower streamlines bounding each channel. Normally the boundary data follows the field data. In the case of PRPRN = -1, however, the boundary information is printed immediately after the general input/output section.

Three lines of identification information head the boundary data, and consist of the program title (STREAMTUBE CURVATURE PROGRAM), the specific case identification, and a designation as to whether the boundary is an upper or lower portion of the given channel. The streamline coordinate (XI2) is given following the channel name. Boundary flow parameters are printed at orthogonal intersection and consist of the following items:

Variable	Description
XI1	Orthogonal (station) numbering coordinate (ξ_1)
S1W	Distance along boundary
XW, ZW	Axial coordinate
YW, RW	Vertical or radial coordinate
ANGW	Flow angle or surface slope
CURVW	Streamline or surface curvature
PS/PO	Local static to reference pressure ratio
CP	Pressure coefficient $C_p = 2(P-P_s)/\gamma P_s M_o^2$ $C_p = Rg(P-P_s)/P_s M_o^2$ (γ = 0, constant density) $C_p = 0$ ($M_o < .1$
PS/PT	Local static to total pressure ratio
MACH	Local Mach number
PT/PO	Ratio of local total to reference static pressure

The cumulative drag/thrust is printed in the column labeled CDPI. The force is normalized by the free stream dynamic pressure (q) and the maximum area based on RM and is given by:

$$\text{CDPI} = \frac{(P-P_{ref})\ dA}{q\ A_{max}}$$

The adjacent column (A-AMAX)/AMAX is projected area normalized by the maximum area. Following the column printout is the ratio of boundary total temperature to ambient total temperature. When the boundary is the approach stagnation streamline, the inlet additive drag is printed below the total temperature ratio. This force is also normalized by q and AMAX and is printed for both the upper and lower stagnation streamline.

Momentum Balance

The STC program evaluates the thrust/drag on each boundary surface bounding a given channel and then verifies these forces by performing an "overall" momentum balance for each of the fluid streams. The integral momentum balance output follows the boundary output for a given channel. This information consists of the entering axial momentum, the integrated pressure forces on the boundaries, and the leaving axial momentum. The discrepancy between the leaving momentum and the sum of the inlet momentum and the pressure-area forces represents the net error in the calculation. This error may be attributed to inaccuracies in the computed pressure distributions or, perhaps, to insufficient refinement of the calculation grid for adequate resolution.

8.0 PROGRAM MESSAGES AND ERROR CODES

8.1 Parameters Describing Solution Status

The solution history output, described briefly in Section 7.2.3, contains a summary of how the solution is proceeding. By reviewing this solution status, the level of grid refinement and the degree of solution convergence can be readily determined. In brief, the solution history is like a "hospital patient's history" in that the general health of the calculation procedure is charted here. (See Section 11 - Sample Cases).

The grid refinement level is specified by the number of times the grid has been refined (NREFIN) and by the number of GRID PTS in the flow field. The number of grid refinements is controlled by MAXIT. The number of points in the flow field is dependent on the grid refinement criteria specified and MAXIT.

The number of inner iterations at any grid refinement level is shown by INRCTR. These are controlled by built-in tolerances on the flow balance, but the internal program control can be overridden by inputting NINNER(m) where m refers to the level of grid refinement.

The system of built-in tolerances is shown in Figure 8-1. The iteration tolerances are controlled by TØLINR and by TØLES2 which are input. The system starts with the maximum streamline movement (MAX-ES2) demanded by the "flow balance" in FLOBAL and compares this to a specified limit, LIM-ES2. If the MAX-ES2 is within limits, the "flow balance" is satisfied and more grid refinement is called for (if the limit has not been reached); otherwise, inner iterations continue until the specified tolerance, LIM-ES2, is met (or the specified NINNER limit is met). The specified tolerance, LIM-ES2, is controlled by TOLINR and the current grid size. Thus, the "flow balance" tolerance becomes smaller as the grid refinement proceeds.

If the grid refinement (MAXIT) criteria is satisfied or the field point limit is reached, a second tolerance (TØLES2) defines a final series of inner iterations. This permits a looser tolerance (TOLINR) during the flow field grid development and then a final tight tolerance (TØLES2) for actual flow field definition. The summary of this iteration tolerance is shown as NREFIN, GRID PTS, LIM-ES2, and MAX-ES2. A scan of the two columns in the flow balance

(See Section 11 - Sample Cases) shows the decreasing values of MAX-ES2 as the solution proceeds. Any erratic behavior in MAX-ES2 indicates convergence problems (the patient's heart is behaving poorly).

During an inner iteration, the streamline displacement (or correction) equation is solved to adjust the streamlines in the flow field. The results of the matrix solution are shown as a maximum streamline adjustment (MAX-DS2) which is actually made and the number of sweeps (NSWEEPS) through the matrix solution (IAD or LRELAX) to reach the final solution. Also shown is the cumulative time to complete the calculations at each level of refinement.

Three other columns, titled "orthogonolization", summarize the orthogonal adjustment in PTMOVE. This history is informative, but does not identify solution problems usually.

Under certain output options, the diagnostic printout includes a line of solution history at the end. Since the history is not summarized neatly on one page, care must be exercised in seeking out the solution history interspersed with the diagnostic output.

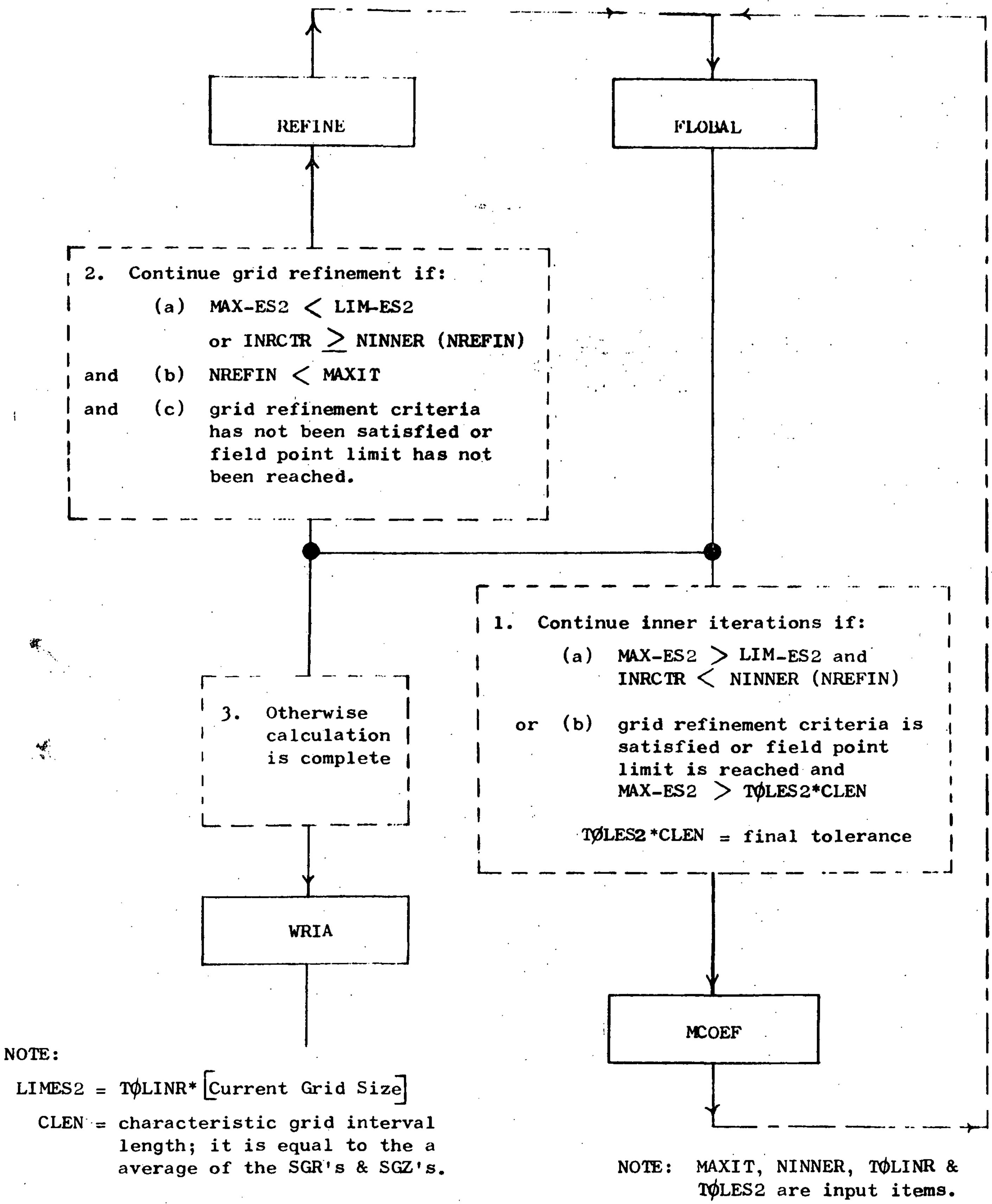


Fig. 8-1 Iteration Tolerance

8.2 STC Error Processing

In general, the occurrence of an error during processing will cause termination of the problem. Each of the main links contain an error print routine which will print the STC tables and the field tables to assist in diagnosing the problem. When the error occurs in overlays subordinate to (0,0), an illegal computed GO TO statement is executed. This will cause a MODE 4 abort and a printout of the sequence of subroutine calls preceding the error.

8.2.1 Description of Table Print Format

In general, the information stored in the STC tables consists of mixed BCD, floating point, integer, and logical data. A special routine (TABPRT) is used to print the arrays which may have a variable data format. The following conventions have been established for the output format on the CDC machines:

Data Type	Print Format
Integer	Integer (I12) Format
Floating Point	E or F Format, depending on the magnitude of the number.
BCD	Hollerith characters A6 Format
Logical	TRUE. Variables are printed as an integer -0 FALSE. Variables are printed as an integer 0

Note that a floating point 0, an integer 0, and a logical.FALSE. are all printed as an integer 0 since the data type, in this instance, is indistinguishable. The program listings (Volume III) may be consulted to determine the true type of the data should this situation arise. A junk word BITS = 10^{15} is utilized in the STC program for testing purposes. This quantity is printed using OCTAL format (O4) and appears as 0000.

Since the data tables used in each overlay differs, the error print may differ slightly between links. The normal order of printed output consists of the general labeled commons, the STC tables (BDYTAB, STATAB, etc), the JMS table, and the field tables such as R, Z, VM, etc. The error print is best illustrated by an example of the typical output after an error in the flow balance (overlays (2,0), (2,1)). The variables in the printout may be identified by referring to Section 6.0 or directly to the program listings. Referring to the example, the initial output consists of the data in labeled commons/ALLCOM/and/CFB/. This latter common block is used as working storage by the flow balance routines. The STC tables BDYTAB, ADJWF and STATAB appear next. These data are packed in common/CHDATA/, with the location designated by the limits set in common/IXORIG/. Note that the relative location within /CHDATA/ is printed as the extreme left column of numbers. Following the STC tables are the /SLTAB/ streamline table and the JMS table denoting the upstream/downstream print connections through the field. The JMS table is followed by the data stored in the field tables S1, S2, Z, R, PHI1, CURV, VM and B. The final printout consists of the labeled common /ERASE2/, used as temporary storage by the flow balance routines. Following the output, a mode 4 error is initiated to obtain the subroutine backtrace.

Common /TROUBL/ contains two logical variables ERR and INERR which may be set to .TRUE. during processing. In this situation, the job is terminated normally in the main program. The table printout is preceded by the comment ERR = T, ERRLOC = n_1, LENTRY = n_2. In this comment, n_1 and n_2 are integers denoting the location of the last overlay call in the MAIN program and the current LENTRY setting (see listings).

8.2.2 Location & Explanation of Specific Error Comments

As mentioned previously, input or calculation errors will result in the termination of the problem. The locations (subroutine name) and description of error conditions are given in the following table. Included are suggested corrective measures (where possible), description of comments preceding the

table print, and a designation of whether the error is FATAL or NON-FATAL. One specific problem deserves further comment. When the iterative solution of the matrix equations for streamline point movement is in trouble (NSWP → MAXSWP), a print of the solution matrix (DS2) and the maximum DS2 will start appearing in the printout. Subroutine IAD is structured to detect this problem and provide the iteration history over a complete cycle as the solution proceeds from over-relaxation to under-relaxation. In this case, the problem may usually be detected by inspection of the solution matrix. Appropriate corrections would be to input a RHOBAS larger than the preset value or preferentially sweep the field in a single direction.

Subroutine Name	Location Nearest Statement No.	Type	Specific Comment	Description and/or Corrective Measures
STCA	12	F	No	ERR=T. The last overlay call and LENTRY setting are given.
ATAN3	50	F	No	Check PHI1 array for spurious flow angles.
LSPFIT	119	F	No	Integration - XC not in same order as X. Will also occur if only 1 point in X table.
QIREM	44	F	No	Number of iterations greater than specified limit.
STANO	120	F	No	Requested station not present in the Station Table.
STAX1	120	F	No	Requested station not present in the Station Table.
REDINP	400	F	Yes	Second field on input header card not BDY or CHN.
RBD	55	F	Yes	No coordinate input for given boundary.
RCD	950	F	Yes	Insufficient table storage for channel input table. Change limits in /USECDG/.
RELOXY	1030	F	Yes	Number of output points from SMOTH section exceeds allocated storage.
SERS1	50	F	Yes	Series 1 contour cannot be generated. Parameter A not between 0.5 and 1.0.
BLDTAB	360	F	Yes	Boundary table not continuous. Check input.
	460	F	Yes	Leading edge, trailing edge, and boundary points cannot be ordered according to orthogonal no.
BPSORT	187	F	Yes	Coincident orthogonals.
MATINV	1	F	No	Far field solution matrix is singular.
ISBOT	510	F	No	
TTPT	125	F	No	Properties for requested channel not present in convected property table.

Subroutine Name	Location Nearest Statement No.	Type	Specific Comment	Description and/or Corrective Measures
BCONV	200	F	Yes	Flow rate for given channel not defined. Check channel input.
	183	N	Yes	Channel flow rate greater than choked value. Calculation continues.
	185	F	Yes	Static pressure exceeds total pressure for given channel.
BLDTBS	517	F	Yes	Connecting edges not found for given channel.
	561	F	Yes	Connecting edges not found for given channel.
	600	F	No	
	642	F	No	
	654	F	No	
	686	F	No	
	692	F	No	
	720	F	No	
	730	F	No	
	820	F	No	
	835	F	Yes	Negative radius encountered
	866	F	No	
	872	F	No	
	896	F	No	
JOFCHN	70	F	No	Streamlines bounding channel not found.
OBI	105	F	No	Channel name not present in boundary table.
	150	N	Yes	Boundary intersection not found. Point placed in an end interval.
RBCONV	190	F	Yes	Restart - Table of convected properties exceeds allocated memory.

Subroutine Name	Location Nearest Statement No.	Type	Specific Comment	Description and/or Corrective Measures
ADJWF2	800	N	Yes	Unexpected choke at given station.
FLOBAL	534	F	No	Lower far-field boundary not permitted.
	590	F	No	Negative static temperature during flow balance.
ADJWF	282	N	Yes	Choked flow rate less than user input flow rate.
NEWRAP	50	F	No	Number of iterations for satisfaction of Kutta condition exceeded.
BDYPTM	75	F	No	Failure to locate proper interval in the boundary table.
INSTA	210	F	No	
	230	F	No	
	310	F	No	
	330	F	No	
PTMOVE	230	F	No	No control streamline.
	318	F	No	Failure to relocate orthogonal angles and lengths at a double streamline.
	3306	F	No	
	3308	F	No	
	3314	N F	Yes	Magnitude of point movement unreasonable. If first grid refinement, calculation terminated (MAJCTR $\leq$ 1).
	338	F	No	Primary stations extend beyond the ends of the boundary.
REFINE	324	F	Yes Namelist	
	1440	N	Yes	Station table storage limit does not allow a new orthogonal at given station.
	160	F	No	Streamline index of new SL greater than NJ.
	170	N	Yes	Streamline limit reached.

Subroutine Name	Location Nearest Statement No.	Type	Specific Comment	Description and/or Corrective Measures
SLC	148	F	No	Error in locating position of stagnation point.
STTOFI	60	F	No	No. of meshpoints on an orthogonal line greater than MAXOL.
MCOEF	945	F	Yes	Far-field boundary supersonic.
IAD	100 300	F	No	Maximum streamline movement greater than characteristic grid size.
	235	F	No	Solution sweep limit exceeded.
CUFIT	120	F	No	Interval in X table not located. XC not in same order as X (integration)
CUBERS	410	F	No	Erroneous boundary conditions on cubic spline.

8.3 Example - Error Print-Out

*** SOLUTION HISTORY ***

GRID REFINEMENT		INNER ITERATIONS		ORTHOGONALIZATION			FLOW BALANCE		MATRIX SOLUTION		TIME
NREFIN	GRID PTS	INRCTR	CNVF	RMS-DS1 (BEFORE DAMPING)	MAX-DS1 (BEFORE DAMPING)	MAX-DS1 (AFTER)	LIM-ES2	MAX-ES2	MAX-DS2	NSWEEPS	(SEC)
1	50	0	1.00	.295396	.816374	.816374	1.111103	.331967	0.000000	0	23.342
1	50	1	1.00	.090606	.216131	.212991	1.111103	.058843	.246536	10	23.775
2	113	0	1.00	.054078	.196040	.193455	.571197	.222423	0.000000	0	24.901
2	113	1	1.00	.071593	.204397	.169516	.571197	.022326	.146684	10	25.883
3	203	0	1.00	.032812	.112704	.108103	.287300	.159815	0.000000	0	28.048
3	203	1	1.00	.038647	.133330	.122923	.287300	.027973	.064256	12	29.940

ALLCOM

0	625	.922400	14.696000	518.700000	1.000000	1.000000	-0	1716.200
8	1.400000	.922400	14.696000	518.700000	25.472007	606.964249	0000	1716.200
16	0000	0	1.000000	0	-0			

CFB

1	370	9	267	12
5	1	16	5	STC
9	0			
10	RECALL	0	1	STC
14	0	RECALL	0	2
18	STC	8.7749E+76	-5.3503E-08	5.2029-276
22	-6.0906+141	-1.5828-201	1.6884-230	5.1785-276
26	3.7131-218	3.7137-218	-5.3497E-08	-8.1628E-13
30	5.3594-276	3.7145-218	-5.3496E-08	-8.1629E-13

CIDEX

1	90	12	73	102	3

BDYTAB

21	CNTLN	12	0
24	W2	0	0
27	-30.000000	0	0
30	18.000000	0	0
33	NACA1	186	6
36	W2	EXT	57
39	NACA1	6	57
42	CLEX	57	177
45	18.000000	8.400000	3.207758
48	16.200000	8.262330	3.228091
51	14.400000	8.091780	3.241809
54	10.800000	7.733290	3.231861
57	8.100000	7.529710	3.199538
60	6.300000	7.448560	3.173916
63	4.500000	7.413000	3.159220
66	2.500000	7.378000	3.158959
69	.761000	7.348000	3.127089
72	.534000	7.361630	3.025877
75	.383000	7.387280	2.913286
78	.198000	7.451810	2.679988
81	.115600	7.501360	2.512733
84	.083200	7.527230	2.419847
87	.054040	7.556030	2.298442

90	.037900	7.575930	2.203461
93	.017210	7.610000	2.023395
96	0	7.682000	1.570796
99	.001908	7.696762	1.316423
102	.005512	7.707042	1.153397
105	.011630	7.718245	.995129
108	.023396	7.733138	.822100
111	.036056	7.745223	.709076
114	.071395	7.769920	.529693
117	.108036	7.782982	.438062
120	.144000	7.804730	.390284
123	.180000	7.818887	.359559
126	.270000	7.849743	.305627
129	.360000	7.876350	.272841
132	.450000	7.900506	.253163
135	.540000	7.923164	.240028
138	.630000	7.944683	.228989
141	.720000	7.965145	.218320
144	.810000	7.984605	.208171
147	.900000	8.003166	.199075
150	1.080000	8.038038	.184261
153	1.260000	8.070520	.173171
156	1.440000	8.101178	.164602
159	1.620000	8.130378	.157288
162	1.800000	8.158300	.150289
165	2.160000	8.210347	.136448
168	2.520000	8.257360	.123662
171	2.880000	8.299968	.113200
174	3.240000	8.339403	.105501
177	3.600000	8.376532	.099843
180	3.960000	8.411795	.095178
183	4.500000	8.461576	.088692
186	5.400000	8.537374	.079679
189	6.300000	8.605598	.071748
192	7.200000	8.667152	.064719
195	8.100000	8.722533	.058317
198	9.000000	8.772261	.052338
201	10.800000	8.856167	.041011
204	12.600000	8.920332	.030191
207	14.400000	8.965358	.019695
210	16.200000	8.991629	.009565
213	18.000000	9.000000	0
216	27.500000	9.000000	0
219	FF	12	0
222	EXT	-0	0
225	28.000000	60.000000	3.141593
228	-30.000000	60.000000	3.141593

CADJWF

STATAB

270	0	20	1	14	-0
275	SOLID	CNTLN	1	4.9330E-05	.002368
280	FARFLD	FF	1	1.000000	58.000000
285	1026.560	0	8.000000	0	4
290	4.000000	20	15	28	0
295	SOLID	CNTLN	1	.156397	7.507040
300	FARFLD	FF	0	0000	0000
305	1026.383	0	0000	0	18
310	8.000000	20	29	44	0
315	SOLID	CNTLN	1	.312824	15.015550

320	FARFLD	FF	0	0000	0000
325	1026.233	0	0000	0	33
330	10.000000	20	45	61	0
335	SOLID	CNTLN	1	.391285	18.781688
340	FARFLD	FF	0	0000	0000
345	1026.454	0	0000	0	48
350	12.000000	20	62	78	0
355	SOLID	CNTLN	1	.470020	22.560981
360	FARFLD	FF	0	0000	0000
365	1026.965	0	0000	0	63
370	13.000000	20	79	90	0
375	SOLID	CNTLN	1	.509338	24.448215
380	FIELD		0	0000	0000
385	1026.965	0	0000	0	63
390	14.000000	20	91	107	0
395	SOLID	CNTLN	1	.548655	26.335449
400	FARFLD	FF	0	0000	0000
405	1027.714	0	0000	0	78
410	15.000000	20	108	119	0
415	SOLID	CNTLN	1	.586924	28.172340
420	FIELD		0	0000	0000
425	1027.714	0	0000	0	78
430	16.000000	20	120	125	-0
435	SOLID	CNTLN	1	.625192	30.009231
440	LE	NACA1	17	.766416	.057089
445	888.330223	4.6647E-06	8.000000	0	93
450	17.000000	20	126	131	0
455	SOLID	CNTLN	1	.671618	32.237657
460	SOLID	NACA1	8	.207108	.360221
465	876.438058	2.7784E-06	0000	0	98
470	18.000000	20	132	137	0
475	SOLID	CNTLN	1	.718043	34.466084
480	SOLID	NACA1	7	.051872	.103760
485	876.438058	2.7784E-06	0000	0	98
490	19.000000	20	138	143	0
495	SOLID	CNTLN	1	.765726	36.754839
500	SOLID	NACA1	5	.834703	1.504023
505	876.436058	2.7784E-06	0000	0	98
510	20.000000	20	144	149	0
515	SOLID	CNTLN	1	.813408	39.043593
520	SOLID	NACA1	4	.742254	2.009837
525	811.153350	3.6124E-06	0000	0	103
530	21.000000	20	150	154	0
535	SOLID	CNTLN	1	.860839	41.320269
540	SOLID	NACA1	3	.946835	3.425480
545	739.969895	4.3378E-06	0000	0	108
550	22.000000	20	155	159	0
555	SOLID	CNTLN	1	.907315	43.551144
560	SOLID	NACA1	3	.338136	1.223313
565	670.032093	5.0213E-06	0000	0	113
570	23.000000	20	160	164	0
575	SOLID	CNTLN	1	.952969	45.742489
580	SOLID	NACA1	2	.456622	.829225

585	614.172204	5.5621E-06	0000	0	118	
590	24.000000	20	165	169	-0	
595	SOLID	CNTLN	1	.998434	47.924826	
600	SOLID	NACA1	1	.239463	.432305	
605	578.907179	5.9150E-06	0000	0	123	
610	16.000000	20	170	180	-0	
615	LE	NACA1	17	.766416	.057089	
620	FARFLD	FF	1	.482759	28.000000	
625	1028.656	0	8.000000	0	124	
630	17.500000	20	181	187	0	
635	SOLID	NACA1	39	.112033	.020407	
640	FIELD		0	0000	0000	
645	1029.889	0	0000	0	134	
650	19.000000	20	188	198	0	
655	SOLID	NACA1	44	.381859	.138202	
660	FARFLD	FF	0	0000	0000	
665	1029.889	0	0000	0	134	
670	20.500000	20	199	209	0	
675	SOLID	NACA1	47	.660431	.596494	
680	FARFLD	FF	0	0000	0000	
685	1029.889	0	0000	0	134	
690	22.000000	20	210	220	0	
695	SOLID	NACA1	49	.570818	.514937	
700	FARFLD	FF	0	0000	0000	
705	1031.207	0	0000	1.000000	144	
710	25.000000	20	221	231	0	
715	SOLID	NACA1	52	.698586	1.258825	
720	FARFLD	FF	0	0000	0000	
725	1032.383	0	0000	1.000000	154	
730	28.000000	20	232	242	0	
735	SOLID	NACA1	54	.613534	1.104710	
740	FARFLD	FF	0	0000	0000	
745	1033.244	0	0000	1.000000	164	
750	31.000000	20	243	252	0	
755	SOLID	NACA1	56	.529421	.952971	
760	FARFLD	FF	0	0000	0000	
765	1033.657	0	0000	0	174	
770	34.000000	20	253	262	0	
775	SOLID	NACA1	57	.273891	2.601960	
780	FARFLD	FF	0	0000	0000	
785	1033.637	0	0000	0	184	
790	40.000000	20	263	272	-0	
795	SOLID	NACA1	57	1.000000	9.500000	
800	FARFLD	FF	1	0	0	
805	1032.710	0	0000	0	194	

STREAMLINE TABLE-

J	X2	SLCHN	W
1	0.000000	W2	0.000000
2	.500000	W2	.174503
3	1.000000	W2	.349007
4	2.000000	W2	.698013
5	4.000000	W2	1.396026

6	8.000000	W2	2.792052
7	8.000000	EXT	0.000000
8	8.062500	EXT	1.480232
9	8.125000	EXT	2.960463
10	8.250000	EXT	5.920926
11	8.500000	EXT	11.841852
12	9.000000	EXT	23.683705
13	10.000000	EXT	47.367409
14	11.000000	EXT	71.051114
15	12.000000	EXT	94.734819
16	14.000000	EXT	142.102228
17	16.000000	EXT	189.469638

ERASE

1	0	47.816324	1.000000	5.9193E-04	-5.9193E-04
6	-.005384	.003615	3.501105	6.914949	13.917164
11	.251568	.001169	-.001169	-.001761	.001854
16	6.914935	12.257739	9.174089	0	-.001169
21	.001593	0	.001854	3.697651	3.606696
26	13.342548	.277133	-.002565	.003477	.004157
31	.010336	3.606661	3.456225	13.168067	.273899
36	-.004056	.003936	.007533	.017868	3.456140
41	3.267329	12.552175	.275348	-.003191	.002832
46	.007097	.024965	3.267279	1.793356	9.627551
51	.339372	-.001026	6.9507E-04	.003859	.028824
56	1.793353	1.793353	6.564803	.273177	-1.5673E-06
61	-3.6067E-04	6.9664E-04	.029520	1.793353	1.838915
66	6.762188	.265203	7.8187E-04	-8.2247E-04	-.001143
71	.028378	1.838914	1.838918	6.867980	.267752
76	.001269	-.001674	-.002091	.026287	1.838914
81	3.633577	9.972099	.184407	.003544	-.002979
86	-.005218	.021069	3.633509	3.619464	13.836589
91	.262567	.003220	-.004034	-.006199	.014870
96	3.619408	3.585425	13.468429	.268739	.003645
101	-.002487	-.007679	.007191	3.585354	3.501112
106	13.232111	.270961	.001088	-8.7912E-04	-.003575
111	.003615	3.501105	6.914943	18.958424	.184673
116	8.8193E-04	-4.4097E-04	-.001761	.001854	6.914935
121	2.000000	3.630654	0	-4.4097E-04	-9.7856E-04
126	0	.001854	3.486721	6.904338	18.916945
131	.184318	7.0539E-04	-3.5270E-04	-.001684	.001332
136	6.904333	2.000000	3.631365	0	-3.5270E-04
141	4.2882E-04	0	.001332	2.5114E-04	2.1323E-04
146	1.8266E-04	1.5806E-04	1.3845E-04	1.2320E-04	1.1196E-04
151	.001047	.001243	.001515	.001896	.002467
156	.003528	-.094025	.003517	.002444	.001860
161	.001463	.001170	9.4544E-04	7.6891E-04	6.2683E-04
166	5.1699E-04	4.2740E-04	3.5547E-04	2.9765E-04	2.5114E-04
171	2.1374E-04	1.8376E-04	1.5992E-04	1.4141E-04	1.2773E-04
176	8.5214E-04	.001005	.001213	.001492	.001878
181	.002453	.003517	-.094034	.003510	.002438
186	.001855	.001459	.001167	9.4302E-04	7.6706E-04
191	6.2747E-04	5.1610E-04	4.2694E-04	3.5547E-04	2.9812E-04
196	2.5215E-04	2.1539E-04	1.8623E-04	1.6361E-04	1.4687E-04
201	6.9699E-04	8.1756E-04	9.8001E-04	.001194	.001478
206	.001867	.002444	.003510	-.094040	.003505
211	.002434	.001852	.001457	.001166	9.4172E-04
216	7.6620E-04	6.2704E-04	5.1609E-04	4.2739E-04	3.5641E-04
221	2.9963E-04	2.5435E-04	2.1851E-04	1.9074E-04	1.7015E-04
226	5.7291E-04	6.6868E-04	7.9718E-04	9.6499E-04	.001183
231	.001469	.001860	.002438	.003505	-.094044
236	.003502	.002432	.001850	.001456	.001165
241	9.4130E-04	7.6620E-04	6.2747E-04	5.1698E-04	4.2881E-04
246	3.5845E-04	3.0245E-04	2.5821E-04	2.2397E-04	1.9854E-04
251	4.7329E-04	5.4963E-04	6.5194E-04	7.8487E-04	9.5547E-04

256	.001175	.001463	.001855	.002434	.003502
261	-.094046	.003501	.002431	.001849	.001455
266	.001165	9.4171E-04	7.6705E-04	6.2882E-04	5.1891E-04
271	4.3143E-04	3.6196E-04	3.0716E-04	2.6477E-04	2.3326E-04
276	3.9308E-04	4.5407E-04	5.3583E-04	6.4181E-04	7.7706E-04
281	9.4935E-04	.001170	.001459	.001852	.002432
286	.003501	-.094047	.003500	.002430	.001849
291	.001456	.001165	9.4302E-04	7.6890E-04	6.3132E-04
296	5.2221E-04	4.3575E-04	3.6767E-04	3.1504E-04	2.7586E-04
301	3.2831E-04	3.7714E-04	4.4266E-04	5.2747E-04	6.3539E-04
306	7.7205E-04	9.4543E-04	.001167	.001457	.001850
311	.002431	.003500	-.094048	.003500	.002431
316	.001850	.001457	.001167	9.4543E-04	7.7205E-04
321	6.3539E-04	5.2747E-04	4.4266E-04	3.7714E-04	3.2831E-04
326	2.7586E-04	3.1504E-04	3.6767E-04	4.3575E-04	5.2221E-04
331	6.3132E-04	7.6890E-04	9.4302E-04	.001165	.001456
336	.001849	.002430	.003500	-.094047	.003501
341	.002432	.001852	.001459	.001170	9.4935E-04
346	7.7706E-04	6.4181E-04	5.3583E-04	4.5407E-04	3.9308E-04
351	2.3326E-04	2.6477E-04	3.0716E-04	3.6196E-04	4.3143E-04
356	5.1891E-04	6.2882E-04	7.6705E-04	9.4171E-04	.001165
361	.001455	.001849	.002431	.003501	-.094046
366	.003502	.002434	.001855	.001463	.001175
371	9.5547E-04	7.8487E-04	6.5194E-04	5.4963E-04	4.7329E-04
376	1.9854E-04	2.2397E-04	2.5821E-04	3.0245E-04	3.5845E-04
381	4.2881E-04	5.1698E-04	6.2747E-04	7.6620E-04	9.4130E-04
386	.001165	.001456	.001850	.002432	.003502
391	-.094044	.003505	.002438	.001860	.001469
396	.001183	9.6499E-04	7.9718E-04	6.6868E-04	5.7291E-04
401	1.7015E-04	1.9074E-04	2.1851E-04	2.5435E-04	2.9963E-04
406	3.5641E-04	4.2739E-04	5.1609E-04	6.2704E-04	7.6620E-04
411	9.4172E-04	.001166	.001457	.001852	.002434
416	.003505	-.094040	.003510	.002444	.001867
421	.001478	.001194	9.8001E-04	8.1756E-04	6.9699E-04
426	1.4687E-04	1.6361E-04	1.8623E-04	2.1539E-04	2.5215E-04
431	2.9812E-04	3.5547E-04	4.2694E-04	5.1610E-04	6.2747E-04
436	7.6706E-04	9.4302E-04	.001167	.001459	.001855
441	.002438	.003510	-.094034	.003517	.002453
446	.001878	.001492	.001213	.001005	8.5214E-04
451	1.2773E-04	1.4141E-04	1.5992E-04	1.8376E-04	2.1374E-04
456	2.5114E-04	2.9765E-04	3.5547E-04	4.2740E-04	5.1699E-04
461	6.2883E-04	7.6891E-04	9.4544E-04	.001170	.001463
466	.001860	.002444	.003517	-.094025	.003528
471	.002467	.001896	.001515	.001243	.001047
476	1.1196E-04	1.2320E-04	1.3845E-04	1.5806E-04	1.8266E-04
481	2.1323E-04	2.5114E-04	2.9813E-04	3.5642E-04	4.2882E-04
486	5.1893E-04	6.3133E-04	7.7207E-04	9.4937E-04	.001175
491	.001469	.001867	.002453	.003528	-.094012
496	.003546	.002489	.001924	.001553	.001296
501	9.8987E-05	1.0829E-04	1.2094E-04	1.3718E-04	1.5749E-04
506	1.8266E-04	2.1376E-04	2.5216E-04	2.9965E-04	3.5847E-04
511	4.3146E-04	5.2224E-04	6.3542E-04	7.7709E-04	9.5551E-04
516	.001183	.001478	.001878	.002467	.003546
521	-.093990	.003573	.002523	.001971	.001618
526	8.8355E-05	9.6112E-05	1.0669E-04	1.2027E-04	1.3719E-04
531	1.5808E-04	1.8379E-04	2.1542E-04	2.5439E-04	3.0249E-04
536	3.6200E-04	4.3580E-04	5.2753E-04	6.4187E-04	7.8494E-04
541	9.6507E-04	.001194	.001492	.001896	.002489
546	.003573	-.093956	.003616	.002583	.002053
551	7.9758E-05	8.6296E-05	9.5247E-05	1.0672E-04	1.2097E-04
556	1.3850E-04	1.5998E-04	1.8629E-04	2.1858E-04	2.5829E-04
561	3.0726E-04	3.6778E-04	4.4278E-04	5.3598E-04	6.5211E-04
566	7.9736E-04	9.8023E-04	.001213	.001515	.001924
571	.002524	.003617	-.093899	.003693	.002689
576	7.3093E-05	7.8685E-05	8.6373E-05	9.6220E-05	1.0842E-04
581	1.2335E-04	1.4158E-04	1.6381E-04	1.9097E-04	2.2423E-04

586	2.6507E-04	3.1539E-04	3.7755E-04	4.5455E-04	5.5019E-04
591	6.6934E-04	8.1836E-04	.001006	.001244	.001554
596	.001972	.002585	.003695	-.093793	.003840
601	3.4558E-05	3.7069E-05	4.0534E-05	4.4969E-05	5.0451E-05
606	5.7144E-05	6.5284E-05	7.5177E-05	8.7222E-05	1.0192E-04
611	1.1992E-04	1.4203E-04	1.6926E-04	2.0292E-04	2.4464E-04
616	2.9648E-04	3.6110E-04	4.4200E-04	5.4398E-04	6.7412E-04
621	8.4405E-04	.001076	.001424	.002099	-.095697
626	0000	0000	0000	0000	0000
631	0000	0000	0000	0000	0000
636	0000	0000	0000	0000	0000
641	0000	0000	0000	0000	0000
646	0000	0000	0000	0000	0000
651	0000	0000	0000	0000	0000
656	0000	0000	0000	0000	0000
661	0000	0000	0000	0000	0000
666	0000	0000	0000	0000	0000
671	0000	0000	0000	0000	0000
676	0000	0000	0000	0000	0000
681	0000	0000	0000	0000	0000
686	0000	0000	0000	0000	0000
691	0000	0000	0000	0000	0000
696	0000	0000	0000	0000	0000
701	0000	0000	0000	0000	0000
706	0000	0000	0000	0000	0000
711	0000	.001687	.002139	.003161	.003819
716	.004436	.004949	.005339	.005517	.005346
721	.004910	.004152	.003334	.002538	.001208
726	0000	0000	0000	0000	0000
731	0000	0000	0000	0000	0000
736	0000	0000	0000	0000	0000
741	0000	0000	0000	0000	0000
746	0000	0000	0000	0000	0000
751	0000	0000	0000	0000	0000
756	0000	0000	0000	0000	0000
761	0000	0000	0000	0000	0000
766	0000	0000	0000	0000	0000
771	0000	0000	0000	0000	0000
776	60.000000	60.000885	60.003541	60.007967	0000
781	0000	0000	0000	0000	0000
786	0000	0000	0000	0000	0000
791	0000	0000	0000	0000	0000
796	60.219233	60.227820	60.233953	60.237633	60.238860

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1	1	0	15	4	0	16	5	0	17	6	0	18	7	0	19	9	0	20	10	0	21	11	0	22	12	0	23	13	0	24
11	14	0	25	15	0	26	16	0	27	17	0	28	1	1	29	4	2	31	5	3	32	6	4	33	7	5	34	9	6	36
21	10	7	37	11	8	38	12	9	39	13	10	40	14	11	41	15	12	42	16	13	43	17	14	44	1	15	45	3	0	47
31	4	16	48	5	17	49	6	18	50	7	19	51	8	0	52	9	20	53	10	21	54	11	22	55	12	23	56	13	24	57
41	14	25	58	15	26	59	16	27	60	17	28	61	1	29	62	2	0	63	3	30	64	4	31	65	5	32	66	6	33	67
51	7	34	68	8	35	69	9	36	70	10	37	71	11	38	72	12	39	73	13	40	74	14	41	75	15	42	76	16	43	77
61	17	44	78	1	45	79	2	46	80	3	47	81	4	48	82	5	49	83	6	50	84	7	51	85	8	52	86	9	53	87
71	10	54	88	11	55	89	12	56	90	13	57	103	14	58	104	15	59	105	16	60	106	17	61	107	1	62	91	2	63	92
81	3	64	93	4	65	94	5	66	95	6	67	96	7	68	97	8	69	98	9	70	99	10	71	100	11	72	101	12	73	102
91	1	79	108	2	80	109	3	81	110	4	82	111	5	83	112	6	84	113	7	85	114	8	86	115	9	87	116	10	88	117
101	11	89	118	12	90	119	13	74	176	14	75	177	15	76	178	16	77	179	17	78	180	1	91	120	2	92	121	3	93	122
111	4	94	123	5	95	124	6	96	125	7	97	170	8	98	171	9	99	172	10	100	173	11	101	174	12	102	175	1	106	126
121	2	109	127	3	110	128	4	111	129	5	112	130	6	113	131	1	120	132	2	121	133	3	122	134	4	123	135	5	124	136
131	6	125	137	1	126	138	2	127	139	3	128	140	4	129	141	5	130	142	6	131	143	1	132	144	2	133	145	3	134	146
141	4	135	147	5	136	148	6	137	149	1	138	150	2	139	0	3	140	151	4	141	152	5	142	153	6	143	154	1	144	155
151	3	146	156	4	147	157	5	148	158	6	149	159	1	150	160	3	151	161	4	152	162	5	153	163	6	154	164	1	155	165
161	3	156	166	4	157	167	5	158	168	6	159	169	1	160	0	3	161	0	4	162	0	5	163	0	6	164	0	7	114	181
171	8	115	182	9	116	183	10	117	184	11	118	185	12	119	186	13	103	187	14	104	195	15	105	196	16	106	197	17	107	198
181	7	170	188	8	171	189	9	172	190	10	173	191	11	174	192	12	175	193	13	176	194	7	181	199	8	182	200	9	183	201
191	10	164	202	11	185	203	12	186	204	13	187	205	14	177	206	15	178	207	16	179	208	17	180	209	7	188	210	8	189	211
201	9	190	212	10	191	213	11	192	214	12	193	215	13	194	216	14	195	217	15	196	218	16	197	219	17	198	220	7	199	221
211	8	200	222	9	201	223	10	202	224	11	203	225	12	204	226	13	205	227	14	206	228	15	207	229	16	208	230	17	209	231
221	7	210	232	8	211	233	9	212	234	10	213	235	11	214	236	12	215	237	13	216	238	14	217	239	15	218	240	16	219	241
231	17	220	242	7	221	243	8	222	0	9	223	244	10	224	245	11	225	246	12	226	247	13	227	248	14	228	249	15	229	250
241	16	230	251	17	231	252	7	232	253	9	234	254	10	235	255	11	236	256	12	237	257	13	238	258	14	239	259	15	240	260
251	16	241	261	17	242	262	7	243	263	9	244	264	10	245	265	11	246	266	12	247	267	13	248	268	14	249	269	15	250	270
261	16	251	271	17	252	272	7	253	0	9	254	0	10	255	0	11	256	0	12	257	0	13	258	0	14	259	0	15	260	0
271	16	261	0	17	262	0																								

M-ISTAG

90 3 119 3 124 3 125 1 170 1 171 3 187 3

S1

1	0	0	0	0	0	0	0	0	0	-.011812
11	-.013240	-.014097	-.015046	-.015446	7.504672	7.504359	7.504157	7.503683	7.503683	7.502831
21	7.501700	7.500229	7.497169	7.479381	7.473847	7.468955	7.463019	7.458503	15.013182	-.002519
31	15.012030	15.010215	15.007366	15.007366	15.004022	15.002260	14.995496	14.984810	14.965772	14.925316
41	14.905586	14.890004	14.870928	14.857112	18.779321	11.270342	3.760126	18.772888	18.767295	18.759206
51	18.759206	18.752418	18.747209	18.729963	18.709581	18.663425	18.610312	18.573592	18.550883	18.521134
61	18.501516	22.558613	15.048201	7.536552	22.546295	22.534210	22.511048	22.511048	22.489343	22.469226
71	22.422408	22.365654	22.270091	22.190652	22.133321	22.102298	22.061355	22.036201	24.445847	18.822658
81	11.310997	24.434211	24.422467	24.386955	24.386955	26.189498	24.293383	24.214356	24.123799	25.718277
91	26.333081	18.822658	11.310997	26.322129	26.310724	26.262897	26.262897	26.189498	26.117564	26.006322
101	25.881947	25.718277	25.606809	25.533331	25.492870	25.443084	25.412683	28.169972	22.498033	14.987966
111	28.161218	28.154909	28.138720	28.138720	26.949457	27.842050	27.687782	27.541576	34.419075	30.006863
121	22.498033	14.987966	30.000306	29.999090	30.014545	32.235290	26.949457	19.433960	32.219532	32.204803
131	32.176998	34.463716	26.949457	19.433960	34.438762	34.410524	34.434345	36.752471	31.517775	23.993087
141	36.709233	36.664973	36.636302	39.041225	31.517775	23.993087	38.979711	38.919445	38.838322	41.317961
151	26.263457	41.241163	41.163909	41.040495	43.548776	28.492756	43.466716	43.383404	43.242666	45.740122
161	30.683106	45.657036	45.574425	45.444837	47.922458	32.864509	47.839082	47.758160	47.647008	30.014545
171	29.789866	29.566458	29.369226	29.201204	28.985561	28.849761	28.763740	28.715967	28.659959	28.625375
181	31.721812	33.292896	31.345054	31.167177	30.994015	32.572268	32.421372	33.473672	33.292696	33.123674
191	32.965132	32.786827	32.572268	32.421372	32.331636	32.281391	32.222066	32.186159	35.157866	36.800643
201	34.906873	34.765537	34.610527	36.250097	36.125643	36.040313	35.994749	35.938011	35.904234	36.922090
211	36.800643	36.690067	36.565938	36.434229	36.250097	36.125643	36.040313	35.994749	35.938011	35.904234
221	40.371155	40.277457	40.194692	40.108594	40.013797	39.883612	39.762980	39.716603	39.678738	39.630708
231	39.601259	43.820160	43.749559	43.689872	43.637407	43.577590	43.503028	43.433842	43.391680	43.365304
241	43.330540	43.308368	47.269184	47.178965	47.152321	47.126141	47.088387	47.055636	47.032219	47.016826
251	46.995343	46.980823	50.718205	50.643769	50.626209	50.612863	50.589493	50.573348	50.559957	50.551267
261	50.538868	50.531025	57.616246	57.541966	57.526855	57.517196	57.504429	57.497876	57.495375	57.493505
271	57.491972	57.493767								

S2

1	0	3.616083	5.113913	7.232166	7.232166	10.380910	12.775849	16.557189	22.270538	30.653708
11	37.193050	42.743375	52.099352	60.014073	0	3.618802	5.117709	7.237415	7.237415	10.388248
21	12.784631	16.567870	22.283297	30.668348	37.208336	42.758718	52.114056	60.027525	0	2.562083
31	3.623312	5.124203	7.246911	7.246911	10.401023	10.401023	12.799539	16.585567	22.304164	30.691952
41	37.232021	42.781703	52.135017	60.046324	0	2.566882	2.566882	3.629900	5.132939	7.256053
51	7.258053	10.416855	10.416855	12.817840	16.606513	22.327418	30.714265	37.252314	42.800186	52.150671
61	60.059959	0	2.580783	2.580783	3.648695	5.157670	7.285944	7.285944	10.452590	10.452590
71	12.855630	16.647416	22.367095	30.747748	37.281132	42.825671	52.171703	60.078199	0	2.592338
81	2.592338	3.666201	5.183880	7.314671	7.314671	10.490060	10.490060	12.895701	16.685900	22.397880
91	0	2.602834	2.602834	3.682201	5.210264	7.372742	7.372742	10.555039	10.555039	12.959585
101	16.739117	22.437853	30.798538	37.322503	42.861382	52.200835	60.103607	0	2.607274	2.607274
111	3.688125	5.220755	7.485542	7.485542	10.681861	10.681861	13.062615	16.812809	22.469895	0
121	2.610553	2.610553	3.691951	5.219939	7.663774	0	2.615298	2.615298	3.697695	5.221679
131	7.371004	0	2.626965	2.626965	3.713353	5.246881	7.411814	0	2.651722	2.651722
141	3.747628	5.295561	7.460818	0	2.692415	2.692415	3.805284	5.374928	7.579135	0
151	2.752710	3.891263	5.498674	7.760063	0	2.621430	3.989931	5.642266	7.978805	0
161	2.890642	4.089140	5.765193	8.198422	0	2.959665	4.185841	5.919741	8.361058	0
171	3.195639	3.195639	5.523196	9.235464	14.884906	23.212108	29.722414	35.253712	44.565006	52.483418
181	0	2.891510	2.891510	5.167487	8.838425	14.457763	22.764879	0	2.820357	2.820357
191	5.065338	8.696732	14.283807	22.568493	29.061701	34.583696	43.905038	51.798360	0	2.778554
201	2.778554	5.003504	8.609187	14.171024	22.435869	28.920693	34.438050	43.754394	51.645146	0
211	2.750591	2.750591	4.956797	8.543306	14.083313	22.329663	28.806244	34.318941	43.630204	51.518313
221	0	2.705705	2.705705	4.888832	8.448885	13.961836	22.183012	28.647314	34.152687	43.455669
231	51.339346	0	2.682564	2.682564	4.852842	8.397442	13.894565	22.100703	28.557116	34.057498
241	43.354399	51.234613	0	2.671082	4.836443	8.376856	13.670782	22.073621	28.527559	34.025917
251	43.319852	51.198007	0	2.675120	4.842655	8.385433	13.881438	22.065406	28.539092	34.036809
261	43.329344	51.206441	0	2.678751	4.848699	8.394624	13.894232	22.101317	28.555801	34.053276
271	43.343840	51.217696								

Z

1	-29.997632	-29.998195	-29.998864	-30.000030	-30.000030	-30.002820	-30.005062	-30.010580	-30.018372	-30.034696
11	-30.046340	-30.057165	-30.074613	-30.088668	-22.492960	-22.493636	-22.494709	-22.496349	-22.496349	-22.499993
21	-22.503367	-22.510359	-22.521214	-22.543518	-22.559269	-22.574129	-22.596562	-22.614731	-14.984450	-14.984969
31	-14.986166	-14.988654	-14.992673	-14.992673	-14.996624	-15.000576	-15.009587	-15.025801	-15.052643	-15.097621
41	-15.127568	-15.153115	-15.188682	-15.216144	-11.218312	-11.220320	-11.222328	-11.225315	-11.231584	-11.240650
51	-11.240850	-11.248255	-11.255661	-11.275166	-11.301089	-11.355062	-11.412690	-11.459615	-11.492280	-11.536506
61	-11.571763	-7.439019	-7.442474	-7.445929	-7.451959	-7.464761	-7.489118	-7.489118	-7.511473	-7.533628
71	-7.582923	-7.645243	-7.748594	-7.832482	-7.899978	-7.940933	-7.998328	-8.037108	-5.551785	-5.555263
81	-5.558742	-5.564123	-5.576686	-5.613434	-5.613434	-5.661734	-5.710033	-5.791382	-5.887464	-6.020744
91	-3.664551	-3.668050	-3.671550	-3.676277	-3.688619	-3.738438	-3.738438	-3.812704	-3.886970	-4.000460
101	-4.129988	-4.293006	-4.416578	-4.500118	-4.550463	-4.616657	-4.660664	-1.827660	-1.830365	-1.833071
111	-1.837198	-1.844469	-1.866104	-1.866104	-2.016310	-2.166517	-2.321451	-2.471471	-2.659620	.009231
121	.007320	.005410	.001886	-2.9094E-04	.001046	2.237657	2.233029	2.228401	2.221104	2.205418
131	2.139872	4.466084	4.458726	4.451367	4.440277	4.410991	4.396256	6.754839	6.742813	6.730787
141	6.710479	6.664911	6.597678	9.043593	9.026789	9.009984	8.980231	8.917996	8.796565	11.320269
151	11.279546	11.240040	11.159053	10.991547	13.551144	13.507782	13.463405	13.373931	13.183007	15.742469
161	15.697041	15.651496	15.560322	15.374186	17.924626	17.877372	17.831424	17.739950	17.568712	.001046
171	-.224287	-.449721	-.643458	-.813319	-1.026746	-1.173999	-1.269909	-1.327493	-1.399848	-1.448015
181	1.640156	1.480044	1.319931	1.150070	.977551	.765863	.611549	3.377448	3.234696	3.091943
191	2.943774	2.768386	2.558435	2.397083	2.297713	2.237761	2.162172	2.112715	5.094311	4.962633
201	4.870954	4.741229	4.590422	4.396608	4.248945	4.151908	4.094350	4.020099	3.971724	6.813683
211	6.732358	6.651033	6.539496	6.412803	6.234887	6.100833	6.006113	5.950945	5.876028	5.830734
221	10.257355	10.204887	10.152420	10.079815	9.990888	9.867589	9.757806	9.682192	9.634795	9.570649
231	9.527709	13.704305	13.675283	13.646261	13.607613	13.554001	13.486597	13.408455	13.357334	13.321265
241	13.270524	13.234778	17.152947	17.135127	17.122356	17.102425	17.071858	17.030176	16.997614	16.972740
251	16.935193	16.907208	20.601960	20.599923	20.596233	20.589130	20.572940	20.547860	20.525325	20.507156
261	20.478699	20.457395	27.500000	27.498119	27.496877	27.493457	27.487863	27.472370	27.460723	27.449374
271	27.431787	27.420127								

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1	0	3.616083	5.113914	7.232166	7.232166	10.380908	12.775845	16.557180	22.270521	30.653672
11	37.193003	42.743318	52.099279	60.013990	0	3.618802	5.117710	7.237414	7.237414	10.388246

21	12.784626	16.567858	22.283273	30.668293	37.208262	42.758624	52.113936	60.027385	0	2.562660
31	3.623305	5.124194	7.246897	7.246897	8.963770	10.401002	12.799502	16.585495	22.304032	30.691690
41	37.231681	42.781293	52.134520	60.045763	0	1.815056	2.566877	3.629891	5.132917	7.258011
51	7.258011	8.977420	10.416786	12.817671	16.606266	22.326878	30.713469	37.251291	42.799020	52.149323
61	60.058496	0	1.824940	2.580855	3.648766	5.157689	7.285819	7.285819	9.009183	10.452157
71	12.854579	16.645753	22.364155	30.744021	37.276853	42.821108	52.166802	60.073107	0	1.833053
81	2.592328	3.666178	5.183805	7.314279	7.314279	9.041598	10.488199	12.892464	16.681445	22.391869
91	0	1.840552	2.602934	3.682326	5.210433	7.372484	7.372484	9.101685	10.551200	12.952879
101	16.729821	22.425908	30.785368	37.308686	42.847273	52.186424	60.089038	0	1.843617	2.607269
111	3.688111	5.220724	7.485408	7.485408	9.214894	10.667578	13.043286	16.790478	22.464438	0
121	1.845959	2.610580	3.691980	5.219876	7.664471	0	1.849283	2.615282	3.697654	5.221557
131	7.369882	0	1.857405	2.626768	3.713043	5.246199	7.411172	0	1.874974	2.651613
141	3.747531	5.294593	7.458806	0	1.903520	2.691983	3.804388	5.372716	7.573546	0
151	2.752375	3.890261	5.495844	7.750798	0	2.821177	3.988914	5.638901	7.967600	0
161	2.890291	4.087694	5.781255	8.187219	0	2.958704	4.183837	5.915127	8.370366	7.664471
171	9.380886	10.829178	13.150896	16.860399	22.507468	30.834495	37.344604	42.875892	52.207217	60.105650
181	8.133568	9.677690	11.007291	13.276921	16.943803	22.559152	30.864834	8.353820	9.657367	11.160155
191	13.400418	17.027942	22.612085	30.895990	37.388836	42.910734	52.232017	60.125313	8.512546	9.993735
201	11.282110	13.503275	17.105603	22.664262	30.927788	37.411585	42.928942	52.244991	60.135595	8.641511
211	10.108097	11.387342	13.590807	17.175122	22.712596	30.958084	37.434119	42.946625	52.257698	60.145716
221	8.833009	10.274175	11.536694	13.718617	17.277554	22.789143	31.009574	37.473437	42.978607	52.281370
231	60.164932	8.950203	10.378170	11.632140	13.802078	17.346268	22.842962	31.048711	37.504913	43.005171
241	52.301927	60.182058	8.998202	11.669223	13.834547	17.374904	22.868743	31.071475	37.525330	43.023631
251	52.317491	60.195599	9.000000	11.675118	13.842691	17.385421	22.881401	31.085328	37.538975	43.036663
261	52.329157	60.206229	9.000000	11.678751	13.848698	17.394620	22.894224	31.101291	37.555762	43.053225
271	52.343775	60.217632								

PHI1

1	0	3.5914E-04	4.9687E-04	6.3730E-04	6.3730E-04	9.5775E-04	.001172	.001415	.001665	.001845
11	.001910	.001915	.001841	.001687	0	4.8105E-04	6.8484E-04	8.2394E-04	8.2394E-04	.001340
21	.001578	.001891	.002241	.002546	.002594	.002550	.002370	.002139	0	7.9824E-04
31	.001367	.001835	.001957	.001957	.003372	.003378	.003907	.004507	.005053	.004615
41	.004249	.003633	.003161	0	0	.003373	.004445	.003374	.004446	.004499
51	.004499	.008109	.006867	.007445	.006213	.008283	.005537	.004503	.003819	0
61	.004812	0	.006990	.010296	.007816	.011409	.011168	.011168	.017440	.016356
71	.017501	.017217	.014182	.006995	.005385	.004436	0	.006599	0	.010172
81	.015667	.008686	.013967	.020881	.020881	.023538	.027152	.027433	.023911	.003692
91	0	.005650	.010839	.005814	.009791	.043925	.043925	.031873	.051508	.044077
101	.032168	.010261	.008311	.006140	.004949	0	.001451	0	.001633	.001441
111	.002625	.003899	.077241	.077241	.040295	.080697	.058918	.039350	.002779	0
121	.003566	-.001242	.002309	-.002580	-.059797	0	.003147	.004367	.004746	.007305
131	-.060870	0	.012321	.019578	.011015	.016264	.019966	0	.019088	.025711
141	.020117	.028064	.036885	0	.032030	.045963	.031526	.044796	.066356	0
151	.059736	.041187	.059720	.089594	0	.064766	.044731	.064760	.099252	0
161	.063177	.044593	.063177	.091579	0	.060426	.043808	.060418	.078968	.242064
171	.043045	.097032	.066995	.044256	.011735	.009307	.006703	.005339	.156567	.096686
181	.203309	.048387	.093182	.069446	.046743	.103485	.071915	.109015	.043866	.077250
191	.062955	.044846	.012350	.009750	.006954	.005517	.082453	.064361	.063528	.040955
201	.063746	.052899	.040363	.012361	.009765	.006962	.005516	.067815	.053121	.066203
211	.034492	.053511	.044408	.034847	.011469	.009164	.006667	.005346	.044306	.034948
221	.042675	.023934	.034960	.029857	.023941	.009632	.007945	.005985	.004910	.023545
231	.019668	.023204	.013659	.019663	.016431	.013664	.007078	.006124	.004898	.004152
241	.004304	.006149	.007219	.006149	.005771	.005521	.004725	.004361	.003761	.003334
251	7.1398E-15	.001308	3.4752E-04	.001309	.001851	.002451	.003379	.003247	.002890	.002538
261	6.2604E-27	6.1134E-04	6.7956E-04	6.0097E-04	6.9729E-04	9.7970E-04	.002015	.002013	.001748	.001268
271	0	0								

CURV

1	0	0	0	0	0	0	0	0	0	2.5092E-07
11	2.6360E-07	2.5494E-07	2.2135E-07	1.9233E-07	0	-3.1633E-05	-4.7703E-05	-4.9746E-05	-4.9746E-05	-9.6367E-05
21	-1.0865E-04	-1.2451E-04	-1.4413E-04	-1.5888E-04	-1.4881E-04	-1.3507E-04	-1.0979E-04	-9.2871E-05	0	-5.0690E-05
31	-2.0435E-04	-2.5888E-04	-2.5221E-04	-2.5221E-04	-4.4693E-04	-4.4715E-04	-5.1299E-04	-5.7452E-04	-6.0881E-04	-3.9582E-04
41	-3.2282E-04	-2.3094E-04	-1.8290E-04	0	0	-8.6271E-04	-.001131	-8.6292E-04	-.001131	-.001103
51	-.001103	-.001413	-.001416	-.001382	-.001416	-.001138	-2.4530E-04	-1.7819E-04	0	-5.6801E-04

61	-.001030	0	-.002358	-.002358	-.001491	-.002566	-.002452	-.002452	-.001016	-.003695
71	-.004065	-.003510	-.002133	0	.001001	.001667	.001594	-.014536	0	-.011152
81	-.008932	3.5491E-04	-1.4379E-04	-.007903	-.007903	-3.5023E-04	-.008104	-.007019	-.004104	-3.8938E-04
91	0	-3.4234E-04	6.333429	.002902	.004566	-.016659	-.016659	-1.2743E-04	-.018590	-.011556
101	-.005289	-.007946	-.013172	0	-.001894	-.002833	-.004305	0	0	-3.1248E-04
111	5.6662E-04	.001824	-.018848	-.018848	8.6888E-05	-.015254	-.006096	-.003366	0	0
121	2.6505E-06	5.6692E-06	-2.2324E-04	-1.2750E-04	6.336651	0	-.002181	-.001242	-.001973	-.003506
131	-.069649	0	-1.0368E-04	.015237	-.003678	-.004617	-.001497	0	1.2278E-04	5.0163E-05
141	-.004340	-.005851	-.013846	0	.005970	.004707	-.005709	-.008991	-.012914	0
151	2.6649E-04	-.002835	-.004307	-.008187	0	.003514	-3.4939E-04	-2.3482E-04	-5.8357E-04	0
161	4.0096E-04	4.7509E-04	.001680	.007551	0	.004093	3.1800E-18	6.3551E-18	0	6.336651
171	5.8567E-04	-.003687	-.003511	-.002546	.002567	.001972	.001436	.001009	6.5755E-04	4.8566E-04
181	.087561	2.6506E-04	.008016	7.8378E-04	-2.2895E-04	2.8427E-04	3.2458E-04	.019509	3.1310E-04	.009885
191	.006436	.002346	2.5748E-04	3.7791E-15	6.7808E-09	3.7224E-08	1.0207E-07	2.2594E-07	.010047	4.2119E-07
201	.005269	.004734	.002570	0	0	0	0	0	0	.010047
211	0	.006209	.004698	.003479	0	0	0	0	0	0
221	.007466	0	.004376	.003516	.002614	0	0	0	0	0
231	0	.006252	0	.004376	.004093	.003153	0	0	0	0
241	0	0	.003884	.002568	.001973	.001437	0	0	0	0
251	0	0	1.0076E-04	2.2673E-04	2.8406E-04	3.2412E-04	0	0	0	0
261	0	0	-2.0118E-18	-2.5147E-19	1.0055E-18	1.0050E-18	0	0	0	0
271	0	0								

VM

1	1026.570	1026.570	1026.570	1026.570	1026.570	1026.570	1026.570	1026.570	1026.569	1026.567
11	1026.566	1026.564	1026.562	1026.560	1019.273	1019.328	1019.369	1019.499	1019.499	1019.745
21	1019.997	1020.447	1021.232	1022.546	1023.585	1024.392	1025.563	1026.383	1003.310	1003.278
31	1003.409	1003.767	1004.325	1004.325	1004.892	1005.460	1006.625	1008.709	1012.170	1016.945
41	1019.924	1021.954	1024.573	1026.233	981.806054	982.229024	982.651995	983.441561	984.940944	987.387063
51	987.387068	989.422413	991.457758	994.793605	1000.114	1007.457	1015.282	1019.322	1021.622	1024.766
61	1026.454	938.620635	938.886425	939.152215	939.942344	942.121111	946.646636	946.646638	952.412469	958.178300
71	969.529578	985.240571	1001.390	1013.985	1019.229	1022.169	1025.318	1026.965	918.715215	918.597332
81	918.479449	918.230135	917.721937	924.748678	924.748678	937.016728	949.284778	966.471684	986.352196	1003.342
91	898.809795	898.308239	897.806683	896.517925	893.322762	902.850718	902.850718	921.620987	940.391256	963.413791
101	987.463822	1005.294	1016.854	1021.398	1023.843	1026.388	1027.714	892.793861	892.659150	892.524440
111	892.102444	690.826492	451.425359	451.425359	707.399279	963.373200	978.725321	995.642209	1009.331	886.777927
121	887.010061	887.242196	887.686962	888.330223	0	874.223622	874.996051	875.768279	877.349936	880.160713
131	438.219029	861.669717	862.982040	864.294363	867.012910	872.031203	876.438058	819.394740	820.971386	822.548032
141	825.831813	832.384390	843.795704	777.119763	778.960732	780.801701	784.650716	792.737577	811.153350	721.755490
151	723.550501	725.493798	729.547512	739.969895	668.558034	666.903271	669.165394	669.463382	670.032093	621.657235
161	621.757905	621.563811	620.643620	614.172204	584.917930	584.918348	584.917249	585.406345	578.907179	0
171	493.177572	986.355144	994.036851	1003.821	1013.368	1020.801	1023.975	1025.768	1027.672	1028.656
181	543.740661	783.704249	1023.668	1022.337	1021.384	1023.136	1025.833	1087.481	1074.231	1060.981
191	1050.637	1038.947	1032.904	1030.865	1030.378	1030.162	1029.974	1029.889	1099.819	1087.983
201	1076.146	1064.611	1051.188	1041.079	1035.156	1033.091	1032.033	1031.008	1030.548	1112.157
211	1101.734	1091.311	1078.585	1063.429	1049.254	1039.446	1035.805	1033.904	1032.043	1031.207
221	1104.387	1096.669	1088.952	1079.676	1068.051	1055.562	1044.579	1039.651	1036.879	1033.921
231	1032.383	1119.269	1111.784	1104.299	1094.217	1080.311	1064.906	1050.767	1044.053	1040.097
241	1035.665	1033.244	1081.091	1070.332	1065.193	1058.856	1051.853	1044.847	1041.046	1038.563
251	1035.505	1033.657	1048.122	1047.763	1047.173	1046.036	1044.118	1041.305	1039.319	1037.823
261	1035.578	1033.637	1032.729	1032.729	1032.729	1032.729	1032.728	1032.725	1032.723	1032.720
271	1032.715	1032.710								

B

1	33.046281	23.367247	16.523137	9.679029	14.387707	25.331024	28.221617	43.384797	64.413019	66.188418
11	55.244942	68.117596	78.923812	1713.259	36.084952	25.502680	18.013586	10.547693	15.646699	27.512980
21	30.524389	46.644514	68.543783	71.751654	57.375797	69.782190	80.030593	1716.897	30.156960	21.324349
31	15.053383	21.215129	12.405334	18.283599	25.158149	32.032698	35.106983	52.726857	75.431464	76.981430
41	60.062424	71.651217	81.185937	1719.733	36.321170	30.935387	25.549603	17.885828	24.964089	14.526769
51	21.026111	28.771337	36.516563	39.024931	57.053479	79.087848	78.898064	60.579847	71.726594	81.053201
61	1714.602	48.538852	41.380838	34.222824	23.986533	33.357583	19.360932	27.449705	37.124976	46.800247
71	47.100519	64.601094	84.127170	80.839494	60.757668	71.411238	80.538741	1703.036	54.210945	46.291058
81	38.371171	27.192725	38.103165	22.160175	30.137940	40.204616	50.271292	48.043442	64.210844	82.723641
91	59.883038	51.201278	42.519518	30.398917	42.848747	24.959418	32.826175	43.284256	53.742337	48.986365

101	63.820594	81.320111	78.151922	59.142194	70.013253	79.345887	1686.078	61.615458	52.618628	43.621799
111	30.960784	39.839508	12.480197	16.413576	29.565403	42.757229	43.568848	59.078133	77.726684	63.347877
121	54.035979	44.724081	31.522652	36.830268	9.7656E-04	66.991889	57.056455	47.121020	32.945723	42.252684
131	27.437217	70.635902	60.076930	49.517959	34.368794	47.675099	54.873457	83.549375	71.045112	58.540849
141	40.555133	55.689333	62.914635	96.462848	82.013293	67.563739	46.741472	63.703567	70.955813	115.507065
151	81.321029	56.910414	78.981914	90.233873	136.148405	96.203040	67.948728	95.993886	112.326290	156.926351
161	110.978700	78.622358	112.293004	133.450953	175.904619	124.390385	87.933446	125.138233	146.465025	9.7656E-04
171	15.886549	31.772121	38.151331	54.335672	74.133257	73.859198	57.116910	68.370279	77.926740	1664.794
181	2.648713	12.115109	21.581506	28.672501	44.808859	65.988739	68.671641	5.296448	8.343669	11.390890
191	19.193672	35.282047	57.844221	63.484084	52.217581	64.778899	75.264253	1637.113	.924668	3.945712
201	6.966756	14.308180	28.990429	51.367442	59.071493	50.121166	63.228160	74.066983	1622.350	-3.447112
211	-.452246	2.542621	9.422687	22.698812	44.890663	54.658903	48.024750	61.677420	72.869713	1607.587
221	-.686246	1.389933	3.466112	8.810183	20.150174	40.162706	50.070027	45.168690	59.219240	70.816562
231	1581.330	-5.846866	-3.646326	-1.445785	3.584302	13.209322	32.119937	43.599213	41.466523	56.232730
241	68.554824	1562.108	7.129442	9.098670	13.477389	24.710446	42.996010	50.487784	44.294221	57.774392
251	69.220682	1552.893	17.753989	16.181303	19.348063	31.292241	49.046332	54.192179	45.679905	58.348663
261	69.383475	1553.219	22.582879	20.438181	24.093514	38.128902	57.777713	61.804319	50.384032	62.342822
271	72.364807	1572.062								

ERASE2

1	22.270521	22.283273	22.304032	22.326878	22.364155	22.425908	22.507468	22.559152
9	22.612085	22.664262	22.712596	22.789143	22.842962	22.868743	22.881401	22.894224
17	17.385421	17.394620	0.	0.	3.8583-286	1.2410-239	0	0
25	1.0547E+77	2.1215+234	0	0	0	0	0	0
33	52688846848	4294968080	0	0	8.1299-261	0	0	0
41	3.3449-208	1.9511E-05	1.6497-232	1.9512E-05	1.5253-100	1.8831+114	2.0325E-05	1.8831+114
49	1.9511E-05	1.1084E+54	1.9213E-05	1.6497-232	4.5620+116	0	1.2114E+54	-1.5761+116
57	1.8240E+73	2.6729E-60	1.7039-100	6.1376E-21	1.1084E+54	-1.5761+116	3.1620E-64	2.2833+143
65	3.3799+312	-2.8784E+59	1.6497-232	-6.2727E+46	1.8831+114	85.406250	1.1084E+54	-1.5761+116
73	1.0547E+77	2.1215+234	1.6349-191	1.1084E+54	-1.5761+116	3.1620E-64	2.2833+143	3.3799+312
81	-2.8784E+59	1.6497-232	-6.2727E+46	1.8831+114	85.406250	0	0.	1.6497-232
89	4.5621+116	1.1084E+54	0.	3.1620E-64	2.5103-253	3.1052+116	2.7533+317	0
97	3.1620E-64	7.8927-253	7.1247+100	-7.3787E+19	1.6500-232	2.1737-233	7.8485-253	3.9217E-39
105	1.1084E+54	1.0094-179	532480	0	0	0.000000	0	1.7516E-82
113	0	0	0	0	811461	0	0	0.
121	582513	164058	0.	0.	7.1305-216	0	29030	201150
129	-30.018372	-22.521214	-15.052643	-11.355062	-7.748594	-4.293006	-1.026746	.765863
137	2.558435	4.396608	6.234887	9.867589	13.486597	17.071858	20.572940	27.487863
145	20.589130	27.493457	-.109632	-.100283	-.092012	-.084666	.352349	.422450
153	.525502	.695968	1.042682	2.217627	-2.7320E-12	-2.217627	-1.042682	-.695968
161	-.525502	-.422450	-.352349	-.300889	-.261102	-.229205	-.202967	-.180977
169	-.162291	-.146246	-.132354	-.120245	-.109632	-.100283	-.092012	.300889
177	.352349	.422450	.525502	.695968	1.042682	2.217627	-2.7320E-12	-2.217627
185	-1.042682	-.695968	-.525502	-.422450	-.352349	-.300889	-.261102	-.229205
193	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	2.217627
209	-2.7320E-12	-2.217627	-1.042682	-.695968	-.525502	-.422450	-.352349	-.300889
217	-.261102	-.229205	-.202967	-.180977	-.162291	-.146246	-.132354	-.120245
225	-.109632	.229205	.261102	.300889	.352349	.422450	.525502	.695968
233	1.042682	2.217627	-2.4816E-12	-2.217627	-1.042682	-.695968	-.525502	-.422450
241	-.352349	-.300889	-.261102	-.229205	-.202967	-.180977	-.162291	-.146246
249	-.132354	-.120245	.202967	.229205	.261102	.300889	.352349	.422450
257	.001665	.002241	.005053	.008283	.014182	.021517	.027456	.029172
265	.028956	.027332	.024533	.017963	.011012	.005382	.003023	.001413
273	.002451	9.7970E-04	-.132354	.180977	.202967	.229205	.261102	.300889
281	.352349	.422450	.525502	.695968	1.042682	2.217627	-1.2719E-12	-2.217627
289	25.472007	25.472007	25.472007	25.472007	25.472007	25.472007	25.472007	25.472007
297	25.472007	25.472007	25.472007	25.472007	25.472007	25.472007	25.472007	.229205
305	.261102	.300889	.352349	.422450	.525502	.695968	1.042682	2.217627
313	-3.1619E-13	-2.217627	-1.042682	-.695968	-.525502	-.422450	-.352349	-.300889
321	-.261102	-.229205	-.202967	-.180977	-.162291	.146246	.162291	.180977
329	.202967	.229205	.261102	.300889	.352349	.422450	.525502	.695968
337	1.042682	2.217627	2.3448E-13	-2.217627	-1.042682	-.695968	-.525502	-.422450
345	-.352349	-.300889	-.261102	-.229205	-.202967	-.180977	.132354	.146246
353	.162291	.180977	.202967	.229205	.261102	.300889	.352349	.422450

361	.525502	.695968	1.042682	2.217627	4.7429E-13	-2.217627	-1.042682	-.695968
369	-.525502	-.422450	-.352349	-.300889	-.261102	-.229205	-.202967	.120245
377	.132354	.146246	.162291	.180977	.202967	.229205	.261102	.300889
385	0	-1.4413E-04	-6.0881E-04	-.001138	-.002133	-.002111	-.001525	-3.8845E-04
393	6.2910E-04	.001137	.001907	.001709	.002132	.001009	3.3814E-04	1.0035E-18
401	3.2412E-04	1.0050E-18	.132354	.146246	.162291	.180977	.202967	.229205
409	.261102	.300889	.352349	.422450	.525502	.695968	1.042682	2.217627
417	1.3340E-12	-2.217627	-1.042682	-.695968	-.525502	-.422450	-.352349	-.300889
425	-.261102	.100283	.109632	.120245	.132354	.146246	.162291	.180977
433	.202967	.229205	.261102	.300889	.352349	.422450	.525502	.695968
441	1.042682	2.217627	2.2951E-12	-2.217627	-1.042682	-.695968	-.525502	-.422450
449	-.352349	-.300889	.092012	.100283	.109632	.120245	.132354	.146246
457	.162291	.180977	.202967	.229205	.261102	.300889	.352349	.422450
465	.525502	.695968	1.042682	2.217627	2.2951E-12	-2.217627	-1.042682	-.695968
473	-.525502	-.422450	-.352349	.084666	.092012	.100283	.109632	.120245
481	1.6468E-05	1.6468E-05	1.6468E-05	1.6468E-05	1.6468E-05	1.6468E-05	1.6468E-05	1.6468E-05
489	1.6468E-05	1.6468E-05	1.6684E-05	1.6622E-05	1.6589E-05	1.6554E-05	1.6536E-05	-2.217627
497	-1.042682	-.695968	-.525502	-.422450	.078118	.084666	.092012	.100283
505	.109632	.120245	.132354	.146246	.162291	.180977	.202967	.229205
513	0	7.497169	14.965772	18.663425	22.270091	25.726240	28.993524	30.736877
521	32.580231	34.419145	36.258059	39.891574	43.510990	47.096350	50.597456	57.512391
529	50.612863	57.517196	.109632	.120245	.132354	.146246	.162291	.180977
537	.202967	.229205	.261102	.300889	.352349	.422450	.525502	.695968
545	1.042682	2.217627	3.6664E-12	-2.217627	-1.042682	-.695968	.067006	.072261
553	.078118	.084666	.092012	.100283	.109632	.120245	.132354	.146246
561	.162291	.180977	.202967	.229205	.261102	.300889	.352349	.422450
569	.525502	.695968	1.042682	2.217627	3.6664E-12	-2.217627	-1.042682	.062276
577	1.000000	1.000000	1.000000	1.000001	1.000002	1.000003	1.000002	1.000005
585	1.000005	.988631	.995552	.997611	.997520	.998769	.261102	.300889
593	.352349	.422450	.525502	.695968	1.042682	2.217627	3.6664E-12	-2.217627
601	.029510	.031699	.034125	.036823	.039832	.043199	.046979	.051239
609	.056059	.061537	.067794	.074984	.083303	.093012	.104471	.118196
617	.134966	.156033	.183553	.221576	.278632	.376050	.585485	1.397441
625	-3.369270	0	0	0	0	0	0	0
633	0	0	0	0	0	0	0	0
641	64.413019	68.543783	75.431464	79.087848	84.127170	81.320111	74.133257	65.988739
649	57.844221	51.367442	44.890663	40.162706	32.119937	42.996010	49.046332	57.777713
657	31.292241	38.128902	0	0	0	0	0	0
665	0	0	0	0	0	0	0	0
673	518.185979	518.185979	518.185988	518.186031	518.186193	518.186621	518.187067	518.187501
681	516.188339	518.189295	520.894338	520.123475	519.707114	519.272777	519.046001	0
689	0	0	0	0	0	0	0	0
697	0	0	0	0	-10.452715	-.253061	-.183835	-.146383
705	-.120224	-.100190	-.084181	-.071112	-.060323	-.051360	-.043887	-.037637
713	-.032397	-.027993	-.024282	-.021145	-.018485	-.016222	-.014290	-.012634
721	-.011211	-.009983	-.008919	-.007994	-.007188	.044426	-10.706755	-.456208
729	-.340442	-.273374	-.225382	-.188215	-.158349	-.133897	-.113678	-.096866
737	-.082838	-.071100	-.061254	-.052974	-.045991	-.040085	-.035073	-.030805
745	-.027159	-.024033	-.021342	-.019019	-.017004	-.015253	.033192	.042588
753	-10.692466	-.445017	-.331312	-.265792	-.219023	-.182851	-.153804	-.130030
761	-.110377	-.094039	-.080406	-.069001	-.059436	-.051392	-.044610	-.038874
769	1	0	0	1	1	1	1	0
777	1	1	1	0	0	0	0	0
785	0	12.000000	-.108410	-.092346	-.078945	-.067735	-.058334	-.050430
793	-.043766	-.038131	-.033351	-.029282	-.025807	-.022828	-.020265	-.018053
801	.021988	.025512	.030981	.041057	-10.680103	-.434801	-.322776	-.258608
809	-.212948	-.177693	-.149408	-.126271	-.107151	-.091258	-.078002	-.066914
817	-.057616	-.049800	-.043211	-.037641	-.032916	-.028895	-.025461	-.022518
825	-.019987	.018364	.021032	.024853	.030514	.040711	-10.677161	-.432311
833	-.320667	-.256817	-.211422	-.176368	-.148289	-.125308	-.106318	-.090536
841	-.077373	-.066363	-.057133	-.049374	-.042835	-.037307	-.032618	-.028629
849	-.025223	-.022304	.015451	.017563	.020480	.024461	.030222	.040489
857	-10.675253	-.430685	-.319282	-.255636	-.210411	-.175521	-.147541	-.124661
865	1066528.9	1066528.9	1066526.8	1066528.3	1066526.3	1066521.2	1066515.8	1066510.6
873	1066500.5	1066489.0	1033992.3	1043253.0	1048254.9	1053472.7	1056197.1	.024213
881	.030033	.040344	-10.673996	-.429608	-.318361	-.254846	-.209733	-.174936

889	-.147035	-.124221	-.105373	-.089711	-.076649	-.065727	-.056571	-.048876
897	9	23	39	56	73	102	175	186
905	193	204	215	226	237	247	257	267
913	256	266	-.146688	-.123918	-.105107	-.089477	-.076443	-.065544
921	-.056408	-.048731	-.042261	-.036794	-.032159	.009454	.010607	.012158
929	.014142	.016637	.019801	.023946	.029826	.040184	-10.672594	-.428398
937	-.317320	-.253948	-.208955	-.174261	-.146447	-.123707	-.104921	-.089312
945	-.076297	-.065414	-.056292	-.048627	-.042168	-.036710	.008085	.009038
953	.010320	.011954	.013989	.016520	.019710	.023875	.029770	.040140
961	0	7.0057E-04	.001181	.001882	.002860	.004213	.005236	.006092
969	.007523	.008724	-.006650	-.006063	-.005610	-.004780	-.004197	.006940
977	.007729	.008793	.010145	.011822	.013888	.016442	.019649	.023827
985	.029732	.040110	-10.671946	-.427833	-.316829	-.253520	-.208582	-.173933
993	-.146158	-.123451	-.104695	-.089111	-.076117	-.065253	-.056147	-.048496
1001	.005979	.006634	.007518	.008642	.010032	.011736	.013821	.016389
1009	.019607	.023794	.029706	.040090	-10.671762	-.427672	-.316687	-.253396
1017	-.208472	-.173836	-.146072	-.123375	-.104626	-.089050	-.076062	-.065203
1025	.004376	.004376	.004376	-11.555135	-8.017718	-4.638660	0	0
1033	9.3717E-04	5.854381	2.000000	-.006435	4.8262E-04	20.468047	27.425957	27.480117
1041	20.581035	27.490660	-.208393	-.173766	-.146010	-.123319	-.104576	-.089005
1049	-.076021	-.065166	.004490	.004942	.005557	.006339	.007303	.008479
1057	.017007	.017007	.017007	.017007	.017007	.017007	.017007	.017007
1065	.017007	.017007	.016965	.016978	.016985	.016991	.016995	-.123278
1073	-.104539	-.088971	-.075991	.003913	.004291	.004805	.005459	.006265
1081	.007246	.008435	.009872	.011610	.013722	.016310	.019545	.023744
1089	.029666	.040058	-10.671476	-.427418	-.316462	-.253196	-.208294	-.173677
1097	-.145930	-.123247	-.104511	-.088946	.003424	.003740	.004171	.004719
1105	.005394	.006215	.007208	.008404	.009848	.011591	.013706	.016298
1113	.019535	.023736	.029660	.040052	-10.671427	-.427374	-.316423	-.253161
1121	-.208263	-.173649	-.145904	-.123224	-.104490	.003008	.003272	.003634
1129	.004095	.004662	.005351	.006181	.007181	.008383	.009831	.011577
1137	.013696	.016289	.019528	.023731	.029655	.040046	-10.671392	-.427342
1145	-.316394	-.253135	-.208239	-.173627	-.145885	-.123266	.002652	.002874
1153	3	2.960463	5.920926	11.841852	23.683705	47.367409	71.051114	94.734819
1161	142.102228	189.469638	50.159462	73.843167	97.526871	144.894281	192.261690	.040046
1169	15	-.427318	-.316372	-.253115	-.208221	-.173611	-.145870	.002347
1177	.002534	.002792	.003121	.003524	.004012	.004597	.005300	.006141
1185	.007149	.008358	.009810	.011561	.013682	.016278	.019519	.023723
1193	.029649	.040043	-10.671346	-.427300	-.316355	-.253100	-.208207	-.173598
1201	.002084	.002242	.002461	.002740	.003082	.003494	.003968	.004579
1209	.005285	.006129	.007139	.008350	.009804	.011556	.013678	.016275
1217	.019516	.023721	.029647	.040042	-10.671330	-.427286	-.316343	-.253088
1225	-.208196	.001857	.001991	.002177	.002415	.002705	.003055	.003473
1233	.003971	.004566	.005274	.006121	.007132	.008344	.009799	.011552
1241	.013675	.016272	.019514	.023719	.029645	.040041	-10.671318	-.427275
1249	1716.200	1716.200	1716.200	1716.200	1716.200	1716.200	1716.200	1716.200
1257	1716.200	1716.200	1716.200	1716.200	1716.200	1716.200	1716.200	.008340
1265	.009796	.011549	.013672	.016270	.019512	.023718	.029644	.040040
1273	-10.671309	-.427266	-.316325	.001490	.001586	.001722	.001896	.002108
1281	.002362	.002664	.003023	.003447	.003951	.004549	.005261	.006110
1289	.007124	.008337	.009793	.011547	.013671	.016269	.019511	.023717
1297	.029643	.040039	-10.671302	-.427260	6.8767E-04	7.3041E-04	7.9115E-04	8.6865E-04
1305	9.6306E-04	.001076	.001210	.001369	.001556	.001779	.002042	.002354
1313	.002726	.003169	.003699	.004333	.005095	.006013	.007127	.008494
1321	.010210	.012464	.015727	.021887	-10.427823	0	0	0
1329	0	0	0	0	0	0	1	0
1337	0	0	0	0	0	0	0	0
1345	12013.400	12013.400	12013.400	12013.400	12013.400	12013.400	12013.400	12013.400
1353	12013.400	12013.400	12013.400	12013.400	12013.400	12013.400	12013.400	0
1361	0	0	0	0	0	0	0	0
1369	0	0	0	0	0	0	0	0
1377	0	0	0	0	0	0	0	0
1385	0	0	0	0	0	0	0	0
1393	0	0	0	0	0	0	0	0
1401	0	0	0	0	0	0	0	0
1409	0	11	.998473	.999022	.999450	.999755	.999939	0000

1417	.995070	.996100	.997012	.997803	.998473	0	0	0
1425	0	0	0	0	0	0	0	1.003154
1433	1.002128	1.001276	1.000617	1.000175	1.010470	1.008746	1.007145	1.005673
1441	2.500000	2.500000	2.500000	2.500000	2.500000	2.500000	2.500000	2.500000
1449	2.500000	2.500000	2.500000	2.500000	2.500000	2.500000	2.500000	5.544463
1457	6.237321	3.942154	4.046217	4.162809	4.295261	4.448446	4.629923	0
1465	0	0	0	0	0	0	0	0
1473	0	-.427209	-.533612	-.711030	-1.066006	-2.131266	-.214671	-.238254
1481	-.267749	-.305692	-.356308	-.427209	0	0	0	0
1489	0	0	0	0	0	0	-.060400	-.064139
1497	-.068950	-.075722	-.087283	-.048713	-.050500	-.052492	-.054744	-.057339
1505	-.060400	0	0	0	0	0	0	0
1513	0	0	0	105.343627	106.282172	107.220718	108.159263	109.097808
1521	0000	101.589445	102.527991	103.466536	104.405081	105.343627	0	0
1529	0	0	0	0	0	0	0	0

```
ERROR. COMPUTED OR ASSIGNED GO TO STATEMENT
ERROR NUMBER   0001 DETECTED BY ACGOER  AT ADDRESS 055716
CALLED FROM ERROR1  AT 064460
CALLED FROM SLC     AT 076443
CALLED FROM STCXX   AT 064260

ERROR SUMMARY
   ERROR     TIMES
    0001      0001
```

9.0 OPERATING PROCEDURES

The STC program described herein may be run on any Control Data 6400/6600 machine operating under SCOPE 3.0 or a higher level operating system. In general, operating procedures and control card set-ups will differ from site to site. The following comments on program modifications, deck set-ups, and operating instructions are restricted to the program as installed at the NASA Langley Research Center. Minimal changes should be necessary for successful installation at other CDC sites.

9.1 General Operating Procedures

Two versions of STC are available at the LRC computer site, both residing in source and absolute binary form on permanent file (data cell) disc storage. The first version has a maximum flow field data storage of 300 grid points, and may be run from the LRC remote input stations using a job field size of 70_8K locations. It is expected that this version will be used to run problems through the first 2 or 3 grid refinements to assure that the program is operating satisfactorily and the input is correct. For problems of nominal size, it will be necessary to run a larger version of STC at the central site (field length < 70_8K).

The larger version of STC may be created by recompilation (FORTRAN IV RUN compiler) of the two block data subprograms which set the size of the STC table and field point storage (USECDG) and the size of the influence coefficient arrays used in the solution for the streamline adjustment (USECDM). As a guide for setting the size of these labeled commons, a bench-mark field length of 100_8K storage is adequate for a problem of 730 grid points. The commons and arrays which must be altered to increase the problem size are:

1.) Block Data USECDG (overlay 0,0)

Common	Variable	Table/Description
/CDS2/	C12	Field Table - Streamline adjustment
/CRHS/	C16	Field Table - Right hand side of matrix equation.
/CHDATA/	C9	STC Table Storage
/CCURV/	C11	Field Table - Streamline Curvatures
/CPHI1/	C14	Field Table - Flow Angle
/CS1/	C17	Field Table - Distance along streamlines
/CS2/	C18	Field Table - Distance along orthogonal lines
/SLTAB/	C8	Streamline Table - Dimension 3* maximum number of streamlines
/CM/	C13	Field Table - JMS (mesh point connection) array
/CB/	C10	Field Table - Coefficient B in matrix equation.
/CZ/	C20	Field Table - Axial coordinate (X,Z)
/CR/	C15	Field Table - Normal coordinate (Y,R)
/CVM/	C19	Field Table - Velocity

As indicated in the preceding list, 11 variables comprise the flow field tables. These arrays should be dimensioned to the maximum number of mesh points. The exception is /CDS2/, which must be set to a minimum of 900 locations.

Note also that /CZ/ and /CR/ must reside next to each other in memory, as these quantities are used to determine the maximum limit for the number of field points. For problems with a large quantity of boundary input and/or a large number of anticipated orthogonal stations, it may be necessary to increase the size of the STC Table storage common /CHDATA/ beyond the 2046 locations currently allocated. The streamline storage /SLTAB/ is set to accomodate 128 streamlines; this should be of adequate size for most problems. As in the case of /CZ/ and /CR/, the commons /CHDATA/ and /CEND/ must be located adjacent to one another in memory. These items are used to set the maximum limit for the STC table storage.

2.) Block Data USECDM (Overlay 4,0)

Common	Variable	Description
/CA2/	C42	Curvature influence coefficient A2
/CA3/	C43	Curvature influence coefficient A3
/CA4/	C44	Streamline flow difference influence coefficient A4
/CA5/	C45	Curvature influence coefficient A5
/CA6/	C46	Curvature influence coefficient A6
/CA7/	C47	Streamline flow difference influence coefficient A7
/CA8/	C48	Streamline flow difference influence coefficient A8

The dimension of the arrays in these commons should be the same as the dimension of the flow field arrays.

9.2 Recommended Procedures for Program Maintenance & Modification

As mentioned previously, a source and absolute binary copy of the of the STC program are stored on the permanent disc file (data cell) at the LRC computer center. It is recommended that relocatable binary copies of each version be maintained on tape. As changes are made to the program, only those routines which differ need be recompiled. The relocatable binary tape may be updated using standard COPYL and COPYN functions. Subsequent execution from this file will result in the creation of a new absolute binary file which may replace the one currently on the data cell. The updated source decks may also be updated at this time.

The source copy of STC contains *DECK cards as the first card of each subroutine. In running at other CDC sites, the source file may be used directly to initialize an update tape.

9.3 Standard Execution Deck Setups

Normally, the absolute binary (overlay) program will be reloaded from the data cell for execution. The suggested deck set-up is:

```
1
(Job Card)
(user Card)
FETCH (A3727, address on data cell, BINARY, STC)
COPYBR (INPUT, TAPES)
STC.
```

$6 7_8$ (EOR)

[Input Data]

$6 7_{8_9}$ (EOF)

As indicated previously, this deck set-up is applicable at the NASA Langley Research Center computer site. At other installations, the absolute binary file may be reloaded from tape. For example, a typical deck set-up for use on the CDC Cybernet System is:

```
1
(Job Card)
LABEL, STCOVLY, R, VSN = UT611, L = CE1.
COPYBF (STCOVLY, STC)
REWIND (STC)
COPYBF (INPUT, TAPES)
STC.
```

$6 7_8$ (EOR)

[Input Data]

$6 7_{8_9}$ (EOF)

9.4 Restart of STC Program from Data Tape

A partially completed STC problem may be restarted using the output data tape from the previous STC execution. The restart tape is obtained by specifying TAPIN as T on the general input header card and using a file card such as REQUEST or LABEL to assign TAPE2 to a given physical device.

Of course, the logical file TAPE2 must be assigned with "write permit" RING option. In the subsequent restart task, TAPIN must be specified as T on the general input header card. Also, the input file TAPE1 must be defined using an appropriate file card (NORING). The input for the restart case should consist of the identification cards, the general input header card, and the first $A namelist. For example, to restart a job after 3 major grid refinements and run to 5 grid refinements, the example input might appear as:

```
2
NAME =J. Smith
ADDRES = LRC
IDENT = NASA 8 INLET
2    4          14          24
1    STC        T           F
$A
MAXIT = 5,
$
```

Intermediate output at a given MAXIT level may be obtained by running a restart case and not assigning TAPE2 and TAPE1. In this instance, these files are assigned to disc and switched at the end of each total set of input. This option is also useful for changing program tolerances at a given stage of the calculation.

The preceding example could be run as one case using the following input:

```
2
NAME = J. Smith
ADDRES = LRC
IDENT =NASA 8 1 INLET
2    4          14          24
1    STC        F           T
$A
MAXIT = 3
.
.
.
$
          remainder of case input
```

```
1    STC      T      F
$A
MAXIT = 5,
$
```

Successive restart cases may be stacked in sequence. On all but the final one, use 1 STC T T as the header card.

10.0 HELPFUL USER HINTS

10.1 General Comments

The following section is a compilation of information for the user. Many items have been covered elsewhere, but they will be repeated in this section for emphasis. The intent is to identify key input parameters so that computer solutions can be accomplished with minimum user problems or errors.

The primary items of importance are:

1. Smooth input geometry
2. Grid refinement definition
3. Iteration tolerances
4. How to get out of trouble when the solution doesn't converge.

10.2 Smooth Input Geometry

The Streamtube Curvature method uses the boundary or body surface curvature as the geometry parameter which causes velocity and/or pressure gradients. Thus, the computer program is very sensitive to changes in curvature. Hence, an accurate definition of the boundary coordinates and local angles is imperative if surface curvatures are to be smooth and continuous.

There are two methods to insure smooth input geometry; a) use an analytic boundary or function with continuous first (angle) and second derivatives (curvature) or b) smooth specified boundary coordinates by fitting a curve to the surface points. The definition of an analytic boundary is not always possible and, in some cases, the intersection of two analytic functions will have discontinuous second derivatives. (An ASME nozzle is an ellipse followed by a straight line. The discontinuous second derivative causes a pressure "blip"). Hence, a curve fit technique may be necessary in most cases.

The best curve fit to use is a piecewise smooth cubic since the curvatures are evaluated in STC using the same type of curve fit. Hence, the definition of the coordinates and angles should come from some such geometry smoothing method. As part of the geometry definition, the curvatures should be checked for discontinuities or erratic behavior.

10.3 Grid Refinement

The grid refinement criteria is explained in detail in Section 12. Some comments on use are appropriate with reference to Figure 12-3.

First of all, the purpose of the grid refinement criteria is to maximize the grid refinement in areas of interest and to minimize the flow field grid in areas of smooth flow. By forcing flow field grid points to be used efficiently, computer table size and storage space is minimized and computer time is reduced. Also, the flow field grid can develop without over-constraining the streamline.

The best technique is to first identify the region or regions in the flow field where a high degree of resolution is necessary. The geometric grid refinement criteria in this area is set at a value equal to the grid size desired. As shown in Figure 12-3, a rectangular flow field section on the inlet lip is defined with SGZ = SGR. If a subsidiary plot of SGR vs GR and SGZ vs GZ are set up, the input table is readily developed. In the radial direction, SGR is specified at the centerline, decreases linearly to the region of interest, increases linearly to the outer region value and is constant from there out. In the axial direction, a similar plot can be drawn. The coordinates of these two plots become the input tables for GZ/SGZ and GR/SGR.

In some problems, the geometric grid refinement must be redefined if solution difficulties occur. A demand for excessive grid refinement in a local area can over-constrain the development of the flow field. Only experience will allow the user to make the optimum choice of grid refinement criteria for different problems.

10.4 Iteration Tolerances

The iteration tolerances, TØLINR and TOLES2, have been preset at recommended values for most problems. As explained in Section 8.1, these tolerances control the iteration logic for the grid refinement and the "flow balance" or inner loop solution.

Usually, if the input geometry is properly defined and no errors are made in defining the flow properties (such as setting VARY = T in all the channels), the solution proceeds through several grid refinements with no problems.

When the grid refinement criteria and the iteration tolerances are incompatible, i.e., the tolerances are very small and the grid refinement has high resolution in an area of large streamline curvature, the solution will show instability in the definition of streamline adjustment (MAX-ES2 will not decrease continuously). The remedy is to change the tolerances or the grid refinement or both.

One good procedure is to keep the iteration tolerances relatively large during the flow field grid development and then restart the last grid refinement with smaller tolerances. Again, experience in use of the computer analysis will be necessary to provide guidance in how to do this.

10.5 Trouble Shooting

The Streamtube Curvature Analysis has been set up as a user oriented computer program for the solution of relatively complex transonic flow field problems. Many of the control variables have been preset to the most generally useful value. Hence, a majority of problems will be solved quickly and accurately if the inputs (geometry and channel flow properties) have been defined correctly. But, there will be instances when numerical difficulties will occur.

Invariably, a large percentage of the numerical difficulties can be related to errors in defining the geometry or bad judgement in selecting the grid refinement or iteration tolerances. However, when large supersonic bubbles are present in a transonic flow, convergence problems in the inner loop have been experienced. A dump, very similar to that shown in Section 8.3, will result. The solution history gives the first diagnosis in that the level of grid refinement, the number of inner iterations during the last refinement, and the behavior of MAX-ES2 can be quickly reviewed. Often MAX-EST will start to converge and then show instability. By identifying the appropriate NINNER, the solution can be forced to the next level of grid refinement by rerunning the problem with the NINNER control inserted.

One good procedure is to rerun the program with the MAXIT set to the previous level of successful grid refinement and convergence, to get a complete print-out of the flow field, and then to restart the computer program with new iteration tolerances and/or grid refinement controls. The example cases in Section 11 show a problem solution which has been restarted with changes in iteration tolerances.

11.0 SAMPLE CASE - PROGRAM OUTPUT

The following sample case is the analysis of an inlet lip at a free stream Mach number of 0.80. The geometry is defined as a straight centerline for the lower boundary of the inlet flow (BDY CNTLN W2 and UPPER = F), the coordinates and angles for the inner surface of the inlet lip, the call for a NACA I external cowl lip (CLEX), and a farfield (FF) upper boundary. The grid refinement has been redefined as shown to eliminate some numerical problems. The iteration tolerance is TOLES2 = 1.0. The output print option is initially set for a summary printout of boundary information only (PRPRN = -1). The grid refinement level is set as MAXIT = 8. The input is printed out as the first pages of the output.

After eight grid refinements, the solution history and boundary flow conditions are printed out. The solution is restarted with MAXIT = 12 and again the same printout is requested.

The final iteration keeps the same grid refinement, but decreases the tolerance TOLES2 = .001 for flow balance convergence. The print option is changed to get the full flow field. These results are printed out as shown.

A comparison with test data is shown in Figure 11-1 for the solution after eight grid refinements (approximately 700 grid points) and after twelve grid refinements with the converged flow balance (1100 grid points). The additional resolution near the leading edge of the external lip surface is evident. This is an inviscid solution so that the oscillations in pressure are defined. A boundary layer solution indicates local separation and the test data agrees with this. Once the inviscid solution gets downstream of the separation region, it matches the test data very well.

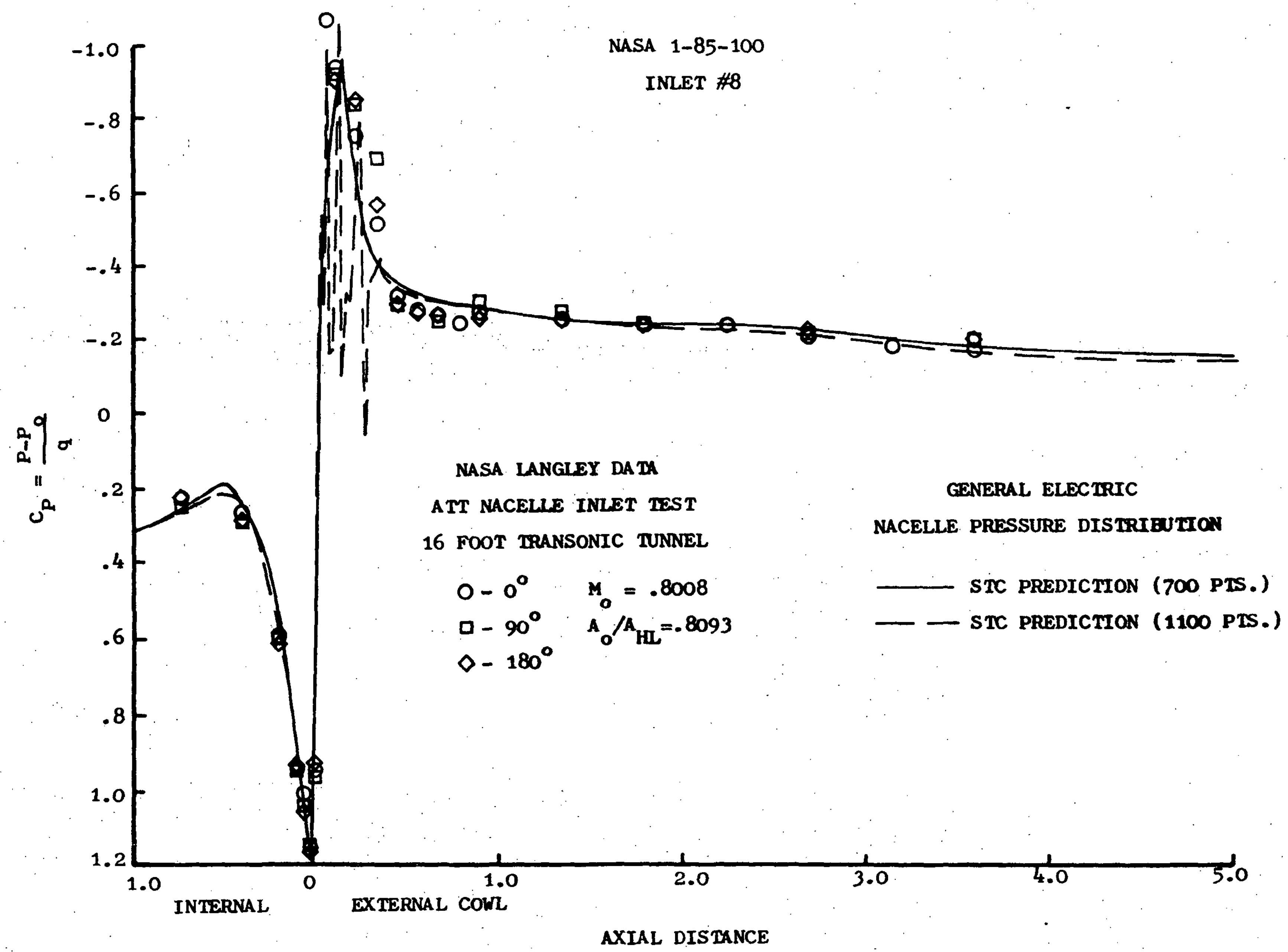

Figure 11-1. Comparison of Predicted and Measured Pressures on Inlet Lip.

CARD INPUT

```
NAME= D A V E    F E R G U S O N
ADDRES=  EVENDALE
IDENT=  NASA INLET CONFIGURATION NO. 8
1 STC         F           T
$A
MACHO=.8,
MAXIT=8,
NGR=5,
GR(1)=0.,7.,8.5,10.,20.,
SGR(1)=3.,1.,1.,3.,12.,
NGZ=6,
GZ(1)=-15.,-7.,-2.,2.,7.,15.,
SGZ(1)=12.,5.,1.,1.,5.,12.,
NGZ=6,GZ(1)=-15.,-2.,.75,3.,5.,12.,
SGZ(1)=12.,1.,1.,.4,7.,15.,
NGR=6,GR(1)=0.,7.,8.5,8.51,10.,20.,
SGR(1)=3.,1.,.4,1.,3.,12.,
TOLFS2=1.
RHL=7.682,RM=9.,
PRPRN=-1.
$
2 BDY         CNTLN       W2
$A
UPPER=F,
B(1)=-30.,0.,0.,
18.,0.,0.,
$
2 BDY         NACA1       W2
$A
UPPER=T,
B(1)=0.,7.682,-90.,
.01721,7.6100,-64.068,
.03790,7.57593,-53.751,
.05404,7.55603,-48.309,
.08320,7.52723,-41.353,
.11560,7.50136,-36.031,
.1980,7.45181,-26.448,
.3830,7.38726,-13.061,
.5340,7.36163,-6.630,
.7610,7.3480,-0.831,
2.500,7.378,0.995,
4.500,7.413,1.010,
6.300,7.44856,1.852,
8.100,7.52971,3.320,
10.800,7.73329,5.172,
14.400,8.09178,5.742,
16.200,8.26233,4.956,
18.00,8.400,3.791,
$
2 BDY         CLEX        EXT
$A
UPPER=F,
ZRONLY=T,
B(1)=991.,1.,0.,7.682,18.,9.,18.,9.,27.5,9.,
$
2 BDY         FF          EXT
$A
UPPER=T,
B(1)=-30.,60.,0.,28.,60.,0.,
```

```
$A
AO=.8093,
$
1 STC        T        T
$A
MAXIT=8,
MAXIT=12,
$
1 STC        T        T
$A
MAXIT=8,TOLES2=.001,PRPRN=0,
MAXIT=12,
$
```

IDENT= NASA INLET CONFIGURATION NO. 8

B O U N D A R Y   C O O R D I N A T E S, BDY=CNTLN CHN=W2 UPPER= F BL= F

I	X,Z	Y,R	ANGD	CURV-	CURV+
1	-30.00000	0.00000	0.000	0.0000	0.0000
2	18.00000	0.00000	0.000	0.0000	0.0000

B O U N D A R Y   C O O R D I N A T E S, BDY=NACA1 CHN=W2 UPPER= T BL= F

I	X,Z	Y,R	ANGD	CURV-	CURV+
1	0.00000	7.68200	-90.000	0.0000	-6.2709
2	.01721	7.61000	-64.068	-5.0772	-4.9234
3	.03790	7.57593	-53.751	-4.0020	-3.9950
4	.05404	7.55603	-48.309	-3.3938	-3.4187
5	.08320	7.52723	-41.353	-2.4725	-2.4495
6	.11560	7.50136	-36.031	-2.0166	-1.9562
7	.19800	7.45181	-26.448	-1.4862	-1.4424
8	.38300	7.38728	-13.081	-.8893	-.8772
9	.53400	7.36163	-6.630	-.5858	-.5779
10	.76100	7.34800	-.831	-.3086	-.0728
11	2.50000	7.37800	.995	.0362	-.0001
12	4.50000	7.41300	1.010	-.0001	.0092
13	6.30000	7.44856	1.852	-.0256	-.0139
14	8.10000	7.52971	3.320	-.0145	-.0145
15	10.80000	7.73329	5.172	-.0094	-.0094
16	14.40000	8.09178	5.742	.0039	.0039
17	16.20000	8.26233	4.956	.0113	.0113
18	18.00000	8.40000	3.791	.0113	0.0000

```
EXECUTING PROGM=STC
TAPIN= F      TAPOT= T
```

IDENT= NASA INLET CONFIGURATION NO. 8

SEGMENT 2 OF BDY=CLEX

* A CURVE HAS BEEN FITTED TO GIVEN X,Y POINTS *

END CONDITIONS - FENDA(1)= 0.00000 FENDA(2)= 0.00000

INPUT COORDINATES XA,ZA	INPUT COORDINATES YA,RA	DEVI	DEV *1000	ADJUSTED COORDINATES X,Z	ADJUSTED COORDINATES Y,R	ANGD DEGREES	CURV	APPLIED FORCES FOK	ARC LENGTH S
18.00000	9.00000	0.00	0.00	18.00000	9.00000	0.000	0.000000	0.00000	0.00000
27.50000	9.00000	0.00	0.00	27.50000	9.00000	0.000	0.000000	0.00000	9.50000

SEGMENT 1 OF BDY=CLEX

IDENT= NASA INLET CONFIGURATION NO. 8

* NACA SERIES-1 COWL CONTOUR *

INPUT DATA. X1= 0.00000 Y1= 7.68200
X2= 18.00000 Y2= 9.00000 A= 1.000

COORDINATE DATA-

X/X	Y/Y	Z	R	ANGD	----- BEAM	CALCULATED	-----
					ANGB	CURV	S
0.000000	0.00000	0.00000	7.68200	90.000	90.000	17.500104	0.00000
.000106	.01120	.00191	7.69676	75.425	75.462	15.857660	.01492
.000306	.01900	.00551	7.70704	66.085	66.093	13.864206	.02583
.000646	.02750	.01163	7.71824	57.017	56.980	10.807238	.03861
.001300	.03880	.02340	7.73314	47.103	47.026	7.307785	.05761
.002003	.04797	.03606	7.74522	40.627	40.613	5.393196	.07512
.003966	.06671	.07140	7.76992	30.349	30.337	2.832944	.11830
.006002	.08117	.10804	7.78898	25.099	25.143	1.544224	.15961
.008000	.09312	.14400	7.80473	22.362	22.394	.897495	.19888
.010000	.10386	.18000	7.81889	20.601	20.612	.709490	.23756
.015000	.12727	.27000	7.84974	17.511	17.483	.437455	.33272
.020000	.14746	.36000	7.87635	15.633	15.619	.255594	.42657
.025000	.16579	.45000	7.90051	14.505	14.518	.156608	.51976
.030000	.18298	.54000	7.92316	13.753	13.772	.123801	.61257
.035000	.19930	.63000	7.94468	13.120	13.124	.120739	.70510
.040000	.21483	.72000	7.96514	12.509	12.497	.116369	.79740
.045000	.22959	.81000	7.98460	11.927	11.915	.104142	.88948
.050000	.24368	.90000	8.00317	11.406	11.403	.090636	.98138
.060000	.27013	1.08000	8.03804	10.557	10.563	.069178	1.16473
.070000	.29478	1.26000	8.07052	9.922	9.924	.052815	1.34763
.080000	.31804	1.44000	8.10118	9.431	9.426	.042313	1.53023
.090000	.34020	1.62000	8.13038	9.012	9.012	.037041	1.71258
.100000	.36138	1.80000	8.15830	8.611	8.622	.037599	1.89473
.120000	.40087	2.16000	8.21035	7.818	7.827	.038750	2.25848
.140000	.43654	2.52000	8.25736	7.085	7.071	.033938	2.62154
.160000	.46888	2.88000	8.29999	6.486	6.470	.023849	2.98405
.180000	.49879	3.24000	8.33940	6.045	6.051	.016564	3.34621
.200000	.52696	3.60000	8.37653	5.721	5.735	.013928	3.70812
.220000	.55371	3.96000	8.41180	5.453	5.458	.012829	4.06984
.250000	.59148	4.50000	8.46158	5.093	5.085	.011162	4.61213
.300000	.64899	5.40000	8.53737	4.565	4.561	.009062	5.51532
.350000	.70076	6.30000	8.60560	4.111	4.117	.008081	6.41790
.400000	.74746	7.20000	8.66715	3.708	3.712	.007612	7.32001
.450000	.78948	8.10000	8.72253	3.341	3.337	.006913	8.22171
.500000	.82721	9.00000	8.77226	2.999	2.993	.006395	9.12309
.600000	.89087	10.80000	8.85617	2.350	2.351	.006045	10.92505
.700000	.93955	12.60000	8.92033	1.730	1.735	.005886	12.72620
.800000	.97372	14.40000	8.96536	1.128	1.132	.005806	14.52677
.900000	.99365	16.20000	8.99163	.548	.544	.005596	16.32697
1.000000	1.00000	18.00000	9.00000	0.000	.000	.004952	18.12700

IDENT= NASA INLET CONFIGURATION NO. 8

CONSOLIDATED OUTPUT DATA

I	S	X,Z	Y,R	ANGD DEGREES	CURV	FQK
1	0.00000	0.00000	7.68200	90.000	17.500104	115.06761
2	.01492	.00191	7.69676	75.425	15.857660	70.93851
3	.02583	.00551	7.70704	66.085	13.864206	57.23452
4	.03861	.01163	7.71824	57.017	10.807238	-55.33965
5	.05761	.02340	7.73314	47.103	7.307785	-77.66618
6	.07512	.03606	7.74522	40.627	5.393196	-49.61809
7	.11830	.07140	7.76992	30.349	2.832944	-29.23370
8	.15961	.10804	7.78898	25.099	1.544224	-14.86643
9	.19888	.14400	7.80473	22.362	.897495	-11.63365
10	.23756	.18000	7.81889	20.601	.709490	-1.99834
11	.33272	.27000	7.84974	17.511	.437455	-.92552
12	.42657	.36000	7.87635	15.633	.255594	-.87657
13	.51976	.45000	7.90051	14.505	.156608	-.70897
14	.61257	.54000	7.92316	13.753	.123801	-.32044
15	.70510	.63000	7.94468	13.120	.120739	.01427
16	.79740	.72000	7.96514	12.509	.116369	.08543
17	.88948	.81000	7.98460	11.927	.104142	.01420
18	.98138	.90000	8.00317	11.406	.090636	-.02993
19	1.16473	1.08000	8.03804	10.557	.069178	-.02758
20	1.34763	1.26000	8.07052	9.922	.052815	-.03195
21	1.53023	1.44000	8.10118	9.431	.042313	-.02861
22	1.71258	1.62000	8.13038	9.012	.037041	-.03197
23	1.89473	1.80000	8.15830	8.611	.037599	-.00010
24	2.25848	2.16000	8.21035	7.818	.038750	.01642
25	2.62154	2.52000	8.25736	7.085	.033938	.01458
26	2.98405	2.88000	8.29999	6.486	.023849	-.00772
27	3.34621	3.24000	8.33940	6.045	.016564	-.01283
28	3.70812	3.60000	8.37653	5.721	.013928	-.00424
29	4.06984	3.96000	8.41180	5.453	.012829	.00004
30	4.61213	4.50000	8.46158	5.093	.011162	-.00077
31	5.51532	5.40000	8.53737	4.565	.009082	-.00119
32	6.41790	6.30000	8.60560	4.111	.008081	-.00059
33	7.32001	7.20000	8.66715	3.708	.007612	.00025
34	8.22171	8.10000	8.72253	3.341	.006913	-.00020
35	9.12309	9.00000	8.77226	2.999	.006395	-.00038
36	10.92505	10.80000	8.85617	2.350	.006045	-.00011
37	12.72620	12.60000	8.92033	1.730	.005886	-.00004
38	14.52677	14.40000	8.96536	1.128	.005806	.00007
39	16.32697	16.20000	8.99163	.548	.005596	.00024
40	18.12700	18.00000	9.00000	0.000	.004952	-.00036
41	18.12700	18.00000	9.00000	0.000	0.000000	0.00000
42	27.62700	27.50000	9.00000	0.000	0.000000	0.00000

IDENT= NASA INLET CONFIGURATION NO. 8

B O U N D A R Y C O O R D I N A T E S. BDY=CLEX CHN=EXT UPPER= F BL= F

DOUBLE POINTS WITH ANGLE DIFFERENCES LESS THAN .010 ARE ELIMINATED (DBLPTS= .010).

I	X.Z	Y.R	ANGD	CURV-	CURV+
1	0.00000	7.68200	90.000	0.0000	17.2095
2	.00191	7.69676	75.425	16.1600	15.5005
3	.00551	7.70704	66.085	14.1340	13.8217
4	.01163	7.71824	57.017	10.7423	11.0169
5	.02340	7.73314	47.103	7.0051	7.5860
6	.03606	7.74522	40.627	5.2668	5.3943
7	.07140	7.76992	30.349	2.8203	2.8129
8	.10804	7.78898	25.099	1.6094	1.4377
9	.14400	7.80473	22.362	.9940	.8288
10	.18000	7.81889	20.601	.7591	.7116
11	.27000	7.84974	17.511	.4208	.4638
12	.36000	7.87635	15.633	.2346	.2613
13	.45000	7.90051	14.505	.1610	.1395
14	.54000	7.92316	13.753	.1436	.1073
15	.63000	7.94468	13.120	.1313	.1221
16	.72000	7.96514	12.509	.1091	.1296
17	.81000	7.98460	11.927	.0908	.1144
18	.90000	8.00317	11.406	.0835	.0908
19	1.08000	8.03804	10.557	.0707	.0666
20	1.26000	8.07052	9.922	.0547	.0529
21	1.44000	8.10118	9.431	.0409	.0441
22	1.62000	8.13038	9.012	.0361	.0349
23	1.80000	8.15830	8.611	.0419	.0346
24	2.16000	8.21035	7.818	.0415	.0385
25	2.52000	8.25736	7.085	.0319	.0383
26	2.88000	8.29999	6.486	.0195	.0262
27	3.24000	8.33940	6.045	.0163	.0139
28	3.60000	8.37653	5.721	.0173	.0107
29	3.96000	8.41180	5.453	.0151	.0128
30	4.50000	8.46156	5.093	.0104	.0120
31	5.40000	8.53737	4.565	.0084	.0091
32	6.30000	8.60560	4.111	.0084	.0074
33	7.20000	8.66715	3.708	.0082	.0075
34	8.10000	8.72253	3.341	.0067	.0075
35	9.00000	8.77226	2.999	.0058	.0066
36	10.80000	8.85617	2.350	.0060	.0059
37	12.60000	8.92033	1.730	.0061	.0056
38	14.40000	8.96536	1.128	.0060	.0057
39	16.20000	8.99163	.548	.0055	.0058
40	18.00000	9.00000	0.000	.0049	-.0000
41	27.50000	9.00000	0.000	.0000	0.0000

IDENT= NASA INLET CONFIGURATION NO. 8

B O U N D A R Y   C O O R D I N A T E S, BDY=FF   CHN=EXT   UPPER= T   BL= F

I	X,Z	Y,R	ANGD	CURV-	CURV+
1	-30.00000	60.00000	0.000	0.0000	0.0000
2	28.00000	60.00000	0.000	0.0000	0.0000

THE FAR FIELD INTERFACE BOUNDARY IS AT R= 60.000 BETWEEN Z= -30.000 AND 28.000. (BDY=FF)

EXTENDED FAR FIELD BOUNDARY

Z=	-44.500	R=	60.000
Z=	42.500	R=	60.276

GRID REFINEMENT		*** INNER ITERATIONS		SOLUTION HISTORY ORTHOGONALIZATION			*** FLOW BALANCE		MATRIX SOLUTION		TIME
NREFIN	GRID PTS	INRCTR	CNVF	RMS-DS1 (BEFORE	MAX-DS1 DAMPING)	MAX-DS1 (AFTER)	LIM-ES2	MAX-ES2	MAX-DS2	NSWEEPS	(SEC)
1	50	0	1.00	.339268	.950116	.950116	1.111143	.448546	0.000000	0	3.695
1	50	1	1.00	.116128	.290649	.285712	1.111143	.085578	.309104	10	4.098
2	113	0	1.00	.047688	.126851	.125906	.571258	.271098	0.000000	0	5.119
2	113	1	1.00	.077651	.222160	.202396	.571258	.031976	.173140	10	6.002
3	178	0	1.00	.037566	.121604	.115558	.287101	.198591	0.000000	0	7.583
3	178	1	1.00	.038743	.134626	.125314	.287101	.014362	.096257	12	9.081
4	221	0	1.00	.023972	.107857	.101838	.177647	.135963	0.000000	0	10.627
4	221	1	1.00	.019677	.078305	.073353	.177647	.027946	.053074	14	12.602
5	327	0	1.00	.031355	.150353	.132628	.143136	.339370	0.000000	0	17.273
5	327	1	1.00	.018115	.080448	.076424	.143136	.056816	.053916	16	20.452
6	484	0	1.00	.026729	.114493	.106429	.094054	.296080	0.000000	0	28.186
6	484	1	1.00	.013026	.078086	.073655	.094054	.155687	.022294	18	33.209
6	484	2	1.00	.006628	.055621	.053353	.094054	.028410	.009147	18	38.228
7	598	0	1.00	.019001	.092070	.085941	.061348	.193082	0.000000	0	47.619
7	598	1	1.00	.009169	.057393	.054028	.061348	.024433	.025494	18	54.060
8	656	0	1.00	.006156	.043764	.041794	.048778	.083202	0.000000	0	60.243
8	656	1	1.00	.011886	.047862	.040970	.048778	.036482	.019695	20	67.844

```
IDENT=  NASA INLET CONFIGURATION NO. 8

GENERAL INPUT-

     AXI    =        T                     MACHO =   .8000
     RG     =     1.00                     TSO   =    1.00
     GAM    =   1.4000                     PSO   =   1.000
     TTE    =    0.000                     PTO   =    1.52
     CHOTST=         T                     TTO   =   1.128

STREAMLINE END CONDITIONS-
     NHCIN =         2         2
     ACF   =     0.000     0.000

CURVATURE CALCULATION FOR SUPERSONIC FLOW-
     SSFML =         1   (FORMULA NUMBER)
     SSFEND=      .750   (DOWNSTREAM END CONDITION, SSFML=2 ONLY)
     SSFNDI=      .750   (UPSTREAM END CONDITION, SSFML=2 ONLY)
     SSEANG=     0.000   (INLET FLOW ANGLE, DEGREES, SSEF=T ONLY)

SUBSONIC/SUPERSONIC BRANCH SELECTION-
     SSEF  =         F   (SUPERSONIC ENTERING FLOW, T OR F)
     SSDF  =         F   (SUPERSONIC FLOW DOWNSTREAM OF CHOKE STATION, T OR F)
     SSDLE =         F   (SUPERSONIC FLOW BELOW AND AFT OF A L.E. POINT, T OR F)

GRID SIZE CRITERIA-
     NGR/GR=      0.00      7.00      8.50      8.51     10.00     20.00
     SGR   =      3.00      1.00       .40      1.00      3.00     12.00

     NGZ/GZ=    -15.00     -2.00       .75      3.00      5.00     12.00
     SGZ   =     12.00      1.00      1.00       .40      7.00     15.00

     VMG1  =       .10                          VMG2  =       .10

     CRX   =      .375      .375      .125     0.000     0.000     0.000

MEMORY UTILIZATION-
                         USED    AVAILABLE
     GRID POINTS          656       1500
     TABLES              1309       3070
     STREAMLINES           30        128

CONVERGENCE DATA-
     MAXIT =         8   (MAXIMUM ITERATIONS)
     NREFIN=         8 - NUMBER OF REFINEMENT ITERATIONS
     INRCTR=         1 - NUMBER OF ADDITIONAL ITERATIONS AFTER LAST REFINEMENT

     TOLINR= 5.0E-02     (INNER ITERATION TOLERANCE ON S.L. MOVEMENT)
     TOLFS2= 1.0E+00     (FINAL TOLERANCE ON S.L. MOVEMENT)
     CLEN  =     4.733 - CHARACTERISTIC LENGTH BASED ON GRID SIZE CRITERIA
               4.7E+00 - ABSOLUTE TOLERANCE ON S.L. MOVEMENT
     MAXFS2= 3.6E-02   - LARGEST S.L. MOVEMENT ON LAST ITERATION

     DSIDMP=      .020   (STREAMWISE PT MOVEMENT DAMPING, =0 FOR NO DAMPING)
     NODENS=         0   (REFINEMENT LEVEL TO WHICH CONSTANT DENSITY IS ASSUMED)
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IDENT=  NASA INLET CONFIGURATION NO. 8

SPECIAL BOUNDARY OPTIONS-
     FARFLD=  FF

MATRIX SOLUTION PARAMETERS-
     IADM   =        0   (=-1,0,1, FOR STREAMLINE, ALTERNATING, AND ORTHOGONAL LINE RELAXATION)
     RHOBAS=      .500   (ACCELERATION FACTOR, BASE LEVEL)
     RHOAMP=      .500   (ACCELERATION FACTOR, AMPLITUDE OF VARIATION)
     TOLRL = 1.0E-03     (TOLERANCE RELATIVE TO MAXDS2)

     HIGHLIGHT RADIUS=   7.682    HIGHLIGHT AREA= 185.395
     MAX. BODY RADIUS=   9.000    MAX. BODY AREA= 254.469

CONTENTS OF CHANNEL TABLE-

     CHN    =  W2           WTFLOW=  1.0000E+15
     TTO    =*0000.00       PTO    =*000.000      TSO    =*0000.00     PSO    =*000.000
     MACHO  =*00.0000       AO     =  8.0930E-01 VARY   =          T
     RG     =*0000.00       GAM    =*00.0000

CHANNEL FLOW RATES, PRESSURES, AND TEMPERATURES-

                SPECIFIED      ADJUSTED        PT/PSO       TT/TSO
     W2           47.7593       47.7593        1.5243       1.1280
     EXT        3552.2407     3552.2407        1.5243       1.1280
```

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=W2 , STREAMLINE COORDINATE, XI2= 0.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-29.99564	0.00000	0.000	0.00000	1.002	.005	.657	.7979	0.0000	1.000	1.000
4.000	7.517	-22.47911	0.00000	0.000	0.00000	1.010	.022	.662	.7902	0.0000	1.000	1.000
8.000	15.044	-14.95204	0.00000	0.000	0.00000	1.024	.054	.672	.7754	0.0000	1.000	1.000
10.000	18.816	-11.17986	0.00000	0.000	0.00000	1.041	.092	.683	.7586	0.0000	1.000	1.000
12.000	22.622	-7.37398	0.00000	0.000	0.00000	1.072	.161	.703	.7274	0.0000	1.000	1.000
13.000	24.542	-5.45408	0.00000	0.000	0.00000	1.099	.221	.721	.7001	0.0000	1.000	1.000
13.500	25.510	-4.48590	0.00000	0.000	0.00000	1.114	.254	.731	.6847	0.0000	1.000	1.000
14.000	26.483	-3.51307	0.00000	0.000	0.00000	1.130	.290	.741	.6680	0.0000	1.000	1.000
14.500	27.450	-2.54558	0.00000	0.000	0.00000	1.146	.327	.752	.6513	0.0000	1.000	1.000
14.750	27.931	-2.06487	0.00000	0.000	0.00000	1.152	.340	.756	.6450	0.0000	1.000	1.000
15.000	28.404	-1.59193	0.00000	0.000	0.00000	1.161	.360	.762	.6355	0.0000	1.000	1.000
15.250	28.868	-1.12761	0.00000	0.000	0.00000	1.166	.371	.765	.6305	0.0000	1.000	1.000
15.500	29.313	-.68301	0.00000	0.000	0.00000	1.174	.389	.770	.6222	0.0000	1.000	1.000
15.750	29.727	-.26908	0.00000	0.000	0.00000	1.190	.424	.781	.6056	0.0000	1.000	1.000
16.000	30.007	.01104	0.00000	0.000	0.00000	1.180	.402	.774	.6157	0.0000	1.000	1.000
16.250	30.454	.45789	0.00000	0.000	0.00000	1.182	.407	.776	.6137	0.0000	1.000	1.000
16.500	31.064	1.06790	0.00000	0.000	0.00000	1.186	.415	.778	.6098	0.0000	1.000	1.000
16.750	31.641	1.64516	0.00000	0.000	0.00000	1.189	.422	.780	.6063	0.0000	1.000	1.000
17.000	32.204	2.20851	0.00000	0.000	0.00000	1.192	.429	.782	.6031	0.0000	1.000	1.000
17.250	32.761	2.76499	0.00000	0.000	0.00000	1.195	.435	.784	.6001	0.0000	1.000	1.000
17.500	33.318	3.32194	0.00000	0.000	0.00000	1.198	.442	.786	.5970	0.0000	1.000	1.000
18.000	34.435	4.43894	0.00000	0.000	0.00000	1.204	.456	.790	.5900	0.0000	1.000	1.000
19.000	36.707	6.71069	0.00000	0.000	0.00000	1.222	.496	.802	.5709	0.0000	1.000	1.000
20.000	39.013	9.01711	0.00000	0.000	0.00000	1.247	.551	.818	.5435	0.0000	1.000	1.000
21.000	41.300	11.30406	0.00000	0.000	0.00000	1.276	.615	.837	.5109	0.0000	1.000	1.000
22.000	43.536	13.54083	0.00000	0.000	0.00000	1.303	.677	.855	.4782	0.0000	1.000	1.000
24.000	47.948	17.95257	0.00000	0.000	0.00000	1.349	.780	.885	.4211	0.0000	1.000	1.000

TT/TTO = 1.000

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=W2 , STREAMLINE COORDINATE, XI2= 8.000.

XI1	S1W	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.00007	6.91374	.074	0.00000	1.002	.005	.657	.7979	0.0000	.410	1.000
4.000	7.515	-22.48506	6.92449	.097	-.00011	1.009	.021	.662	.7906	.0000	.408	1.000
8.000	15.030	-14.97009	6.94612	.277	-.00073	1.023	.050	.671	.7773	.0002	.404	1.000
10.000	18.788	-11.21267	6.97119	.515	-.00148	1.036	.081	.680	.7634	.0004	.400	1.000
12.000	22.545	-7.45555	7.02262	1.165	-.00456	1.061	.135	.696	.7389	.0014	.391	1.000
13.000	24.424	-5.57744	7.07127	1.876	-.00865	1.078	.174	.707	.7214	.0027	.383	1.000
13.500	25.363	-4.63870	7.10581	2.337	-.00850	1.091	.203	.716	.7081	.0038	.377	1.000
14.000	26.303	-3.70034	7.14932	3.063	-.01844	1.107	.238	.726	.6922	.0055	.369	1.000
14.500	27.242	-2.76278	7.20738	4.007	-.01680	1.128	.285	.740	.6706	.0082	.359	1.000
14.750	27.712	-2.29442	7.24266	4.684	-.03333	1.140	.313	.748	.6576	.0101	.352	1.000
15.000	28.181	-1.82660	7.28450	5.513	-.02848	1.159	.356	.761	.6377	.0126	.345	1.000
15.250	28.651	-1.35948	7.33352	6.566	-.04976	1.181	.404	.775	.6150	.0160	.336	1.000
15.500	29.121	-.89366	7.39356	8.231	-.07474	1.223	.498	.802	.5698	.0209	.325	1.000
15.625	29.356	-.66162	7.42973	9.616	-.13051	1.248	.553	.818	.5427	.0244	.319	1.000
15.750	29.590	-.43075	7.47277	11.567	-.16395	1.298	.666	.852	.4845	.0292	.311	1.000
15.875	29.825	-.20243	7.52755	16.248	-.52853	1.396	.885	.916	.3562	.0371	.300	1.000
16.000	30.060	.01709	7.61024	-14.117	5.08615	1.524	1.170	1.000	0.0000	.0529	.285	1.000

TT/TTO = 1.000

ADDITIVE DRAG = .0529

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=W2 , STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
16.000	0.000	.01709	7.61024	-14.117	5.08615	1.524	1.170	1.000	0.0000	.0529	.285	1.000
16.125	.276	.22799	7.43778	-23.752	-1.36780	1.248	.554	.819	.5422	.0253	.317	1.000
16.187	.414	.35846	7.39329	-14.438	-.96797	1.136	.302	.745	.6625	.0218	.325	1.000
16.250	.552	.49390	7.36680	-8.081	-.66497	1.087	.195	.713	.7118	.0206	.330	1.000
16.375	.828	.76923	7.34768	-.797	-.07227	1.121	.270	.735	.6777	.0198	.333	1.000
16.500	1.104	1.04536	7.34658	.211	-.05504	1.146	.327	.752	.6511	.0198	.334	1.000
16.750	1.656	1.59757	7.35525	1.405	-.02040	1.169	.378	.767	.6271	.0203	.332	1.000
17.000	2.209	2.14965	7.37014	1.502	.01425	1.187	.418	.779	.6082	.0214	.329	1.000
17.250	2.761	2.70181	7.38151	.997	-.00013	1.191	.427	.781	.6041	.0223	.327	1.000
17.500	3.313	3.25401	7.39113	1.001	-.00013	1.193	.430	.782	.6025	.0230	.326	1.000
18.000	4.418	4.35840	7.41050	1.009	-.00013	1.197	.440	.785	.5979	.0246	.322	1.000
19.000	6.627	6.56697	7.45769	2.066	-.01403	1.197	.441	.786	.5975	.0284	.313	1.000
20.000	8.836	8.77300	7.57195	3.855	-.01322	1.224	.501	.803	.5683	.0384	.292	1.000
21.000	11.045	10.97488	7.74926	5.263	-.00876	1.263	.587	.829	.5254	.0566	.259	1.000
22.000	13.254	13.17321	7.96660	5.857	-.00063	1.304	.678	.855	.4781	.0833	.216	1.000
24.000	17.672	17.57273	8.37065	4.068	.01127	1.351	.783	.886	.4190	.1428	.135	1.000

TT/TTO = 1.000

INTEGRAL MOMENTUM BALANCE, CHN=W2 (AXIAL FORCES ONLY)

ENTERING MOMENTUM	=	134.4362
LOWER BOUNDARY PRESSURE FORCE	=	0.0000
UPPER BOUNDARY PRESSURE FORCE	=	16.2800
SUM OF ABOVE		150.7162
LEAVING MOMENTUM	=	150.6165
ERROR	=	.0997

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=EXT , STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.00007	6.91374	.074	0.00000	1.002	.005	.657	.7979	0.0000	.410	1.000
4.000	7.515	-22.48506	6.92449	.097	-.00011	1.009	.021	.662	.7906	-.0000	.408	1.000
8.000	15.030	-14.97009	6.94612	.277	-.00073	1.023	.050	.671	.7773	-.0002	.404	1.000
10.000	18.788	-11.21267	6.97119	.515	-.00148	1.036	.081	.680	.7634	-.0004	.400	1.000
12.000	22.545	-7.45555	7.02262	1.165	-.00456	1.061	.135	.696	.7389	-.0014	.391	1.000
13.000	24.424	-5.57744	7.07127	1.876	-.00865	1.078	.174	.707	.7214	-.0027	.383	1.000
13.500	25.363	-4.63870	7.10581	2.337	-.00850	1.091	.203	.716	.7081	-.0038	.377	1.000
14.000	26.303	-3.70034	7.14932	3.063	-.01844	1.107	.238	.726	.6922	-.0055	.369	1.000
14.500	27.242	-2.76278	7.20738	4.007	-.01680	1.128	.285	.740	.6706	-.0082	.359	1.000
14.750	27.712	-2.29442	7.24266	4.684	-.03333	1.140	.313	.748	.6576	-.0101	.352	1.000
15.000	28.181	-1.82660	7.28450	5.513	-.02848	1.159	.356	.761	.6377	-.0126	.345	1.000
15.250	28.651	-1.35948	7.33352	6.566	-.04976	1.181	.404	.775	.6150	-.0160	.336	1.000
15.500	29.121	-.89366	7.39356	8.231	-.07474	1.223	.498	.802	.5698	-.0209	.325	1.000
15.625	29.356	-.66162	7.42973	9.616	-.13051	1.248	.553	.818	.5427	-.0244	.319	1.000
15.750	29.590	-.43075	7.47277	11.567	-.16395	1.298	.666	.852	.4845	-.0292	.311	1.000
15.875	29.825	-.20243	7.52755	16.248	-.52853	1.396	.685	.916	.3562	-.0371	.300	1.000
16.000	30.060	.01769	7.61024	57.208	5.08615	1.524	1.170	1.000	0.0000	-.0529	.285	1.000

TT/TTO = 1.000

ADDITIVE DRAG = -.0529

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=EXT . STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
16.000	0.000	.01709	7.61024	57.208	5.08615	1.524	1.170	1.000	0.0000	-.0529	.285	1.000
16.187	.217	.11628	7.79278	24.377	1.33602	.682	-.709	.448	1.1360	-.0610	.250	1.000
16.281	.325	.21676	7.83216	19.140	.59286	.767	-.520	.503	1.0414	-.0563	.243	1.000
16.375	.433	.31980	7.86486	16.317	.33684	.799	-.449	.524	1.0069	-.0532	.236	1.000
16.469	.541	.42397	7.89371	14.776	.18995	.823	-.396	.540	.9814	-.0508	.231	1.000
16.563	.649	.52873	7.92040	13.848	.14307	.850	-.335	.558	.9529	-.0489	.226	1.000
16.750	.865	.73930	7.96940	12.367	.12131	.863	-.305	.566	.9391	-.0459	.216	1.000
17.125	1.298	1.16346	8.05336	10.247	.06106	.881	-.265	.578	.9204	-.0411	.199	1.000
17.500	1.730	1.58979	8.12557	9.076	.03744	.893	-.239	.586	.9087	-.0375	.185	1.000
17.875	2.162	2.01732	8.19033	8.149	.03877	.896	-.233	.588	.9058	-.0344	.172	1.000
18.250	2.595	2.44586	8.24805	7.225	.03330	.899	-.225	.590	.9020	-.0317	.160	1.000
18.625	3.027	2.87520	8.29944	6.491	.01970	.909	-.203	.596	.8921	-.0295	.150	1.000
19.000	3.460	3.30507	8.34626	5.991	.01456	.919	-.181	.603	.8818	-.0276	.140	1.000
19.750	4.324	4.16571	8.43117	5.307	.01188	.928	-.160	.609	.8726	-.0247	.122	1.000
20.500	5.189	5.02720	8.50698	4.762	.00990	.935	-.144	.614	.8653	-.0222	.107	1.000
22.000	6.919	6.75192	8.63730	3.913	.00779	.939	-.136	.616	.8617	-.0184	.079	1.000
25.000	10.378	10.20574	8.83071	2.557	.00618	.945	-.123	.620	.8554	-.0130	.037	1.000
28.000	13.838	13.66296	8.94921	1.380	.00587	.949	-.114	.622	.8517	-.0099	.011	1.000
34.000	20.756	20.58128	9.00000	.000	-.00000	.984	-.035	.646	.8157	-.0090	.000	1.000
40.000	27.675	27.50000	9.00000	.000	.00000	.998	-.005	.654	.8024	-.0090	.000	1.000

TT/TTO = 1.000

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=EXT , STREAMLINE COORDINATE, XI2= 16.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.17306	60.02524	.163	-.00000	1.002	.005	.657	.7979	0.0000	-43.482	1.000
4.000	7.483	-22.69032	60.04720	.179	-.00007	1.002	.004	.657	.7983	.0001	-43.514	1.000
8.000	14.872	-15.30090	60.07231	.211	-.00008	1.001	.003	.657	.7986	.0003	-43.552	1.000
10.000	18.512	-11.66137	60.08621	.227	-.00008	1.001	.003	.657	.7988	.0003	-43.572	1.000
12.000	22.068	-8.10480	60.10078	.242	-.00007	1.001	.002	.657	.7990	.0004	-43.594	1.000
14.000	25.475	-4.69826	60.11552	.253	-.00005	1.001	.001	.656	.7994	.0004	-43.616	1.000
16.000	28.376	-1.79697	60.12853	.260	-.00003	1.000	.001	.656	.7997	.0004	-43.635	1.000
19.000	32.279	2.10522	60.14637	.263	-.00000	1.000	-.000	.656	.8001	.0004	-43.662	1.000
22.000	35.994	5.82110	60.16335	.260	.00003	1.000	-.001	.656	.8005	.0004	-43.687	1.000
25.000	39.671	9.49756	60.17975	.251	.00005	.999	-.002	.655	.8009	.0004	-43.711	1.000
28.000	43.328	13.15443	60.19542	.240	.00006	.999	-.003	.655	.8012	.0003	-43.734	1.000
34.000	50.490	20.31661	60.22376	.212	.00008	.998	-.004	.655	.8017	.0002	-43.777	1.000
40.000	57.462	27.28820	60.24838	.197	.00000	.998	-.005	.654	.8024	.0000	-43.813	1.000

TT/TTO = 1.000

INTEGRAL MOMENTUM BALANCE, CHN=EXT (AXIAL FORCES ONLY)

ENTERING MOMENTUM	=	9999.0358
LOWER BOUNDARY PRESSURE FORCE	=	-1.0307
UPPER BOUNDARY PRESSURE FORCE	=	.0053
SUM OF ABOVE		9998.0103
LEAVING MOMENTUM	=	9998.9978
ERROR	=	-.9875

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        EXECUTING PROGM=STC
       TAPIN= T      TAPOT= T

THE FAR FIELD INTERFACE BOUNDARY IS AT R=   60.000 BETWEEN Z=  -30.000 AND   28.000.   (BDY=FF    )

     *EXTENDED FAR FIELD BOUNDARY*
      Z=    -44.500    R=     60.000
      Z=     42.500    R=     60.276
```

*** GRID REFINEMENT		• INNER ITERATIONS		SOLUTION HISTORY • ORTHOGONALIZATION			• *** FLOW BALANCE		• MATRIX SOLUTION		• TIME
NREFIN	GRID PTS	INNCTR	CNVF	RMS-DS1 (BEFORE	MAX-DS1 DAMPING)	MAX-DS1 (AFTER)	LIM-ES2	MAX-ES2	MAX-DS2	NSWEEPS	(SEC)
8	656	1	1.00	.002722	.017938	.016923	.048778	.036405	.019695	20	74.618
9	719	0	1.00	.014953	.063318	.051546	.042464	.037893	0.000000	0	81.363
9	719	1	1.00	.006199	.024120	.023354	.042464	.013682	.009057	22	90.330
10	790	0	1.00	.003860	.031522	.030220	.039085	.056054	0.000000	0	97.431
10	790	1	1.00	.003701	.022596	.020100	.039085	.044829	.008375	22	107.588
10	790	2	1.00	.002378	.015486	.014292	.039085	.036987	.004014	20	117.344
11	951	0	1.00	.003641	.027333	.023724	.033993	.080079	0.000000	0	137.532
11	951	1	1.00	.006082	.022107	.019579	.033993	.056829	.009143	22	150.647
11	951	2	1.00	.003328	.015103	.013901	.033993	.048936	.005289	50	172.451
11	951	3	1.00	.002858	.014563	.013443	.033993	.043777	.002695	30	188.032
11	951	4	1.00	.002546	.012131	.011349	.033993	.019654	.002886	24	201.750
12	1091	0	1.00	.002142	.014840	.013679	.027632	.025507	0.000000	0	215.717
12	1091	1	1.00	.001955	.008837	.008137	.027632	.019994	.002643	28	233.923

```
IDENT=  NASA INLET CONFIGURATION NO. 8

GENERAL INPUT-

     AXI    =        T                          MACHO =   .8000
     PG     =     1.00                          TSO   =    1.00
     GAM    =   1.4000                          PSO   =   1.000
     TTF    =    0.000                          PTO   =    1.52
     CHOTST=         T                          TTO   =   1.128

STREAMLINE END CONDITIONS-
     NBCIN =         2        2
     ACF   =     0.000    0.000

CURVATURE CALCULATION FOR SUPERSONIC FLOW-
     SSFML =         1   (FORMULA NUMBER)
     SSFEND=      .750   (DOWNSTREAM END CONDITION, SSFML=2 ONLY)
     SSFUPI=      .750   (UPSTREAM END CONDITION, SSFML=2 ONLY)
     SSFANG=     0.000   (INLET FLOW ANGLE, DEGREES, SSEF=T ONLY)

SUBSONIC/SUPERSONIC BRANCH SELECTION-
     SSEF  =         F   (SUPERSONIC ENTERING FLOW, T OR F)
     SSDF  =         F   (SUPERSONIC FLOW DOWNSTREAM OF CHOKE STATION, T OR F)
     SSOLE =         F   (SUPERSONIC FLOW BELOW AND AFT OF A L.E. POINT, T OR F)

GRID SIZE CRITERIA-
     NGR/GR=      0.00     7.00     8.50     8.51    10.00    20.00
     SGR   =      3.00     1.00      .40     1.00     3.00    12.00

     NGZ/GZ=    -15.00    -2.00      .75     3.00     5.00    12.00
     SGZ   =     12.00     1.00     1.00      .40     7.00    15.00

     VMG1  =       .10                       VMG2  =       .10

     CMX   =      .375     .375     .125    0.000    0.000    0.000

MEMORY UTILIZATION-
                          USED     AVAILABLE
     GRID POINTS          1091       1500
     TABLES               1869       3070
     STREAMLINES            44        128

CONVERGENCE DATA-
     MAXIT =        12   (MAXIMUM ITERATIONS)
     NREFIN=        12 - NUMBER OF REFINEMENT ITERATIONS
     INRCTR=         1 - NUMBER OF ADDITIONAL ITERATIONS AFTER LAST REFINEMENT

     TOLINR= 5.0E-02     (INNER ITERATION TOLERANCE ON S.L. MOVEMENT)
     TOLES2= 1.0E+00     (FINAL TOLERANCE ON S.L. MOVEMENT)
     CLEN  =     4.733 - CHARACTERISTIC LENGTH BASED ON GRID SIZE CRITERIA
               4.7E+00 - ABSOLUTE TOLERANCE ON S.L. MOVEMENT
     MAXES2= 2.0E-02 - LARGEST S.L. MOVEMENT ON LAST ITERATION

     DSIDMP=      .020   (STREAMWISE PT MOVEMENT DAMPING, =0 FOR NO DAMPING)
     NODENS=         0   (REFINEMENT LEVEL TO WHICH CONSTANT DENSITY IS ASSUMED)
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IDENT=  NASA INLET CONFIGURATION NO. 8

SPECIAL BOUNDARY OPTIONS-
     FARFLD=  FF

MATRIX SOLUTION PARAMETERS-
     IADM  =        0   (=-1,0,1, FOR STREAMLINE, ALTERNATING, AND ORTHOGONAL LINE RELAXATION)
     RHOBAS=     .500   (ACCELERATION FACTOR, BASE LEVEL)
     RHOAMP=     .500   (ACCELERATION FACTOR, AMPLITUDE OF VARIATION)
     TOLRL = 1.0E-03    (TOLERANCE RELATIVE TO MAXDS2)


     HIGHLIGHT RADIUS=   7.682    HIGHLIGHT AREA= 185.395
     MAX. BODY RADIUS=   9.000    MAX. BODY AREA= 254.469

CONTENTS OF CHANNEL TABLE-


     CHN   =  W2          WTFLOW=  1.0000E+15
     TTO   =*0000.00      PTO   =*000.000      TSO   =*0000.00      PSO   =*000.000
     MACHO =*00.0000      AO    =  8.0930E-01 VARY  =       T
     RG    =*0000.00      GAM   =*00.0000

CHANNEL FLOW RATES, PRESSURES, AND TEMPERATURES-

               SPECIFIED     ADJUSTED       PT/PSO       TT/TSO
     W2          47.7593      47.7593       1.5243       1.1280
     EXT       3552.2407    3552.2407       1.5243       1.1280
```

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=W2 , STREAMLINE COORDINATE, XI2= 0.000.

XI1	S1W	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-29.99559	0.00000	0.000	0.00000	1.002	.005	.657	.7979	0.0000	1.000	1.000
4.000	7.517	-22.47841	0.00000	0.000	0.00000	1.010	.022	.662	.7902	0.0000	1.000	1.000
8.000	15.045	-14.95067	0.00000	0.000	0.00000	1.024	.054	.672	.7754	0.0000	1.000	1.000
10.000	18.817	-11.17813	0.00000	0.000	0.00000	1.041	.092	.683	.7586	0.0000	1.000	1.000
12.000	22.624	-7.37202	0.00000	0.000	0.00000	1.072	.161	.703	.7275	0.0000	1.000	1.000
13.000	24.543	-5.45234	0.00000	0.000	0.00000	1.099	.221	.721	.7001	0.0000	1.000	1.000
13.500	25.511	-4.48413	0.00000	0.000	0.00000	1.114	.254	.731	.6848	0.0000	1.000	1.000
14.000	26.484	-3.51163	0.00000	0.000	0.00000	1.130	.291	.742	.6678	0.0000	1.000	1.000
14.500	27.453	-2.54299	0.00000	0.000	0.00000	1.146	.326	.752	.6516	0.0000	1.000	1.000
14.750	27.934	-2.06166	0.00000	0.000	0.00000	1.153	.342	.757	.6440	0.0000	1.000	1.000
15.000	28.409	-1.58670	0.00000	0.000	0.00000	1.160	.358	.761	.6366	0.0000	1.000	1.000
15.250	28.873	-1.12284	0.00000	0.000	0.00000	1.166	.370	.765	.6310	0.0000	1.000	1.000
15.500	29.320	-.67593	0.00000	0.000	0.00000	1.172	.384	.769	.6242	0.0000	1.000	1.000
15.750	29.732	-.26321	0.00000	0.000	0.00000	1.182	.406	.775	.6142	0.0000	1.000	1.000
16.000	30.008	.01258	0.00000	0.000	0.00000	1.178	.398	.773	.6179	0.0000	1.000	1.000
16.250	30.464	.46860	0.00000	0.000	0.00000	1.182	.406	.775	.6141	0.0000	1.000	1.000
16.500	31.072	1.07638	0.00000	0.000	0.00000	1.186	.415	.778	.6098	0.0000	1.000	1.000
16.750	31.649	1.65334	0.00000	0.000	0.00000	1.189	.422	.780	.6062	0.0000	1.000	1.000
17.000	32.212	2.21647	0.00000	0.000	0.00000	1.192	.429	.782	.6031	0.0000	1.000	1.000
17.250	32.768	2.77221	0.00000	0.000	0.00000	1.195	.435	.784	.6000	0.0000	1.000	1.000
17.500	33.324	3.32857	0.00000	0.000	0.00000	1.198	.442	.786	.5969	0.0000	1.000	1.000
18.000	34.441	4.44539	0.00000	0.000	0.00000	1.204	.456	.790	.5899	0.0000	1.000	1.000
19.000	36.712	6.71653	0.00000	0.000	0.00000	1.222	.496	.802	.5708	0.0000	1.000	1.000
20.000	39.017	9.02162	0.00000	0.000	0.00000	1.247	.551	.818	.5434	0.0000	1.000	1.000
21.000	41.303	11.30720	0.00000	0.000	0.00000	1.276	.615	.837	.5108	0.0000	1.000	1.000
22.000	43.538	13.54279	0.00000	0.000	0.00000	1.304	.677	.855	.4782	0.0000	1.000	1.000
24.000	47.948	17.95253	0.00000	0.000	0.00000	1.349	.780	.885	.4211	0.0000	1.000	1.000

TT/TTO = 1.000

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=W2 . STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	COPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.00007	6.91374	.074	0.00000	1.002	.005	.657	.7979	0.0000	.410	1.000
4.000	7.516	-22.48437	6.92447	.097	-.00011	1.009	.021	.662	.7905	.0000	.408	1.000
8.000	15.031	-14.96870	6.94608	.277	-.00073	1.023	.050	.671	.7773	.0002	.404	1.000
10.000	18.749	-11.21093	6.97112	.514	-.00148	1.036	.081	.680	.7634	.0004	.400	1.000
12.000	22.547	-7.45345	7.02246	1.162	-.00454	1.061	.135	.696	.7389	.0014	.391	1.000
13.000	24.426	-5.57516	7.07097	1.870	-.00863	1.078	.174	.707	.7214	.0027	.383	1.000
13.500	25.366	-4.63633	7.10540	2.329	-.00840	1.091	.203	.716	.7081	.0038	.377	1.000
14.000	26.305	-3.69787	7.14876	3.051	-.01646	1.107	.238	.726	.6921	.0055	.369	1.000
14.500	27.244	-2.76020	7.20660	3.990	-.01643	1.127	.284	.740	.6708	.0082	.359	1.000
14.750	27.714	-2.29179	7.24174	4.667	-.03387	1.141	.314	.748	.6571	.0101	.353	1.000
15.000	28.184	-1.82392	7.28342	5.485	-.02687	1.158	.354	.760	.6386	.0126	.345	1.000
15.250	28.654	-1.35671	7.33206	6.498	-.04840	1.180	.402	.774	.6157	.0159	.336	1.000
15.500	29.123	-.89077	7.39146	8.149	-.07429	1.219	.489	.800	.5740	.0207	.326	1.000
15.625	29.358	-.65859	7.42686	9.207	-.08311	1.243	.542	.815	.5478	.0240	.319	1.000
15.750	29.593	-.42742	7.46824	11.475	-.25341	1.293	.655	.848	.4904	.0286	.311	1.000
15.812	29.711	-.31263	7.49304	12.773	-.13315	1.326	.729	.870	.4503	.0318	.307	1.000
15.875	29.828	-.19859	7.52100	15.331	-.62589	1.372	.830	.900	.3908	.0358	.302	1.000
15.906	29.887	-.14225	7.53753	17.344	-.57008	1.406	.907	.923	.3413	.0385	.299	1.000
15.938	29.945	-.08650	7.55595	19.196	-.53153	1.445	.994	.948	.2765	.0417	.295	1.000
15.969	30.004	-.03152	7.57654	22.299	-1.31141	1.488	1.089	.976	.1862	.0457	.291	1.000
15.984	30.033	-.00461	7.58827	24.980	-1.87318	1.513	1.146	.993	.1013	.0482	.289	1.000
16.000	30.063	.02161	7.60147	-16.203	4.74624	1.524	1.170	1.000	0.0000	.0511	.287	1.000

TT/TTO = 1.000

ADDITIVE DRAG = .0511

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=W2 • STREAMLINE COORDINATE• XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
16.000	0.000	.02161	7.60147	-16.203	4.74624	1.524	1.170	1.000	0.0000	.0511	.287	1.000
16.016	.034	.04041	7.57257	-52.801	-3.90439	1.504	1.125	.987	.1394	.0449	.292	1.000
16.031	.069	.06293	7.54647	-45.852	-3.13367	1.461	1.029	.958	.2472	.0396	.297	1.000
16.047	.103	.08815	7.52294	-40.445	-2.38557	1.420	.938	.932	.3195	.0353	.301	1.000
16.062	.138	.11525	7.50161	-36.081	-2.02135	1.375	.837	.902	.3867	.0318	.305	1.000
16.094	.207	.17348	7.46467	-28.933	-1.63463	1.289	.645	.845	.4956	.0267	.312	1.000
16.125	.276	.23551	7.43452	-23.111	-1.34743	1.223	.498	.803	.5696	.0236	.318	1.000
16.156	.345	.30010	7.41030	-18.148	-1.15474	1.163	.364	.763	.6340	.0217	.322	1.000
16.187	.414	.36641	7.39128	-13.985	-.94241	1.120	.269	.735	.6781	.0206	.326	1.000
16.250	.552	.50195	7.36568	-7.775	-.64910	1.097	.215	.719	.7025	.0194	.330	1.000
16.375	.828	.77721	7.34777	-.764	-.07178	1.121	.271	.736	.6770	.0186	.333	1.000
16.500	1.104	1.05321	7.34661	.236	-.05455	1.147	.328	.752	.6507	.0186	.334	1.000
16.750	1.656	1.60514	7.35544	1.414	-.01992	1.170	.379	.767	.6268	.0191	.332	1.000
17.000	2.208	2.15694	7.37033	1.496	.01471	1.188	.419	.779	.6078	.0202	.329	1.000
17.250	2.760	2.70883	7.38163	.997	-.00013	1.191	.427	.781	.6042	.0211	.327	1.000
17.500	3.312	3.26076	7.39125	1.001	-.00013	1.193	.430	.783	.6024	.0218	.326	1.000
18.000	4.416	4.36460	7.41061	1.009	-.00013	1.197	.440	.785	.5979	.0234	.322	1.000
19.000	6.624	6.57209	7.45788	2.070	-.01403	1.197	.441	.786	.5975	.0272	.313	1.000
20.000	8.832	8.77705	7.57223	3.858	-.01321	1.225	.501	.803	.5682	.0372	.292	1.000
21.000	11.040	10.97769	7.74954	5.265	-.00874	1.263	.587	.829	.5253	.0555	.259	1.000
22.000	13.248	13.17520	7.96680	5.858	-.00063	1.304	.678	.855	.4780	.0821	.216	1.000
24.000	17.664	17.57273	8.37065	4.068	.01127	1.351	.783	.886	.4190	.1416	.135	1.000

TT/TTO = 1.000

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INTEGRAL MOMENTUM BALANCE.  CHN=W2        (AXIAL FORCES ONLY)
     ENTERING MOMENTUM                =   134.4362
     LOWER BOUNDARY PRESSURE FORCE =        0.0000
     UPPER BOUNDARY PRESSURE FORCE =       16.1457
          SUM OF ABOVE                    150.5819
     LEAVING MOMENTUM                 =   150.6166
          ERROR                       =     -.0346
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IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=EXT , STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.00007	6.91374	.074	0.00000	1.002	.005	.657	.7979	0.0000	.410	1.000
4.000	7.516	-22.48437	6.92447	.097	-.00011	1.009	.021	.662	.7905	-.0000	.408	1.000
8.000	15.031	-14.96870	6.94608	.277	-.00073	1.023	.050	.671	.7773	-.0002	.404	1.000
10.000	18.789	-11.21093	6.97112	.514	-.00148	1.036	.081	.680	.7634	-.0004	.400	1.000
12.000	22.547	-7.45345	7.02246	1.162	-.00454	1.061	.135	.696	.7389	-.0014	.391	1.000
13.000	24.426	-5.57516	7.07097	1.870	-.00863	1.078	.174	.707	.7214	-.0027	.383	1.000
13.500	25.366	-4.63633	7.10540	2.329	-.00840	1.091	.203	.716	.7081	-.0038	.377	1.000
14.000	26.305	-3.69787	7.14876	3.051	-.01846	1.107	.238	.726	.6921	-.0055	.369	1.000
14.500	27.244	-2.76020	7.20660	3.990	-.01643	1.127	.284	.740	.6708	-.0082	.359	1.000
14.750	27.714	-2.29179	7.24174	4.667	-.03387	1.141	.314	.748	.6571	-.0101	.353	1.000
15.000	28.184	-1.82392	7.28342	5.485	-.02687	1.158	.354	.760	.6386	-.0126	.345	1.000
15.250	28.654	-1.35671	7.33206	6.498	-.04840	1.180	.402	.774	.6157	-.0159	.336	1.000
15.500	29.123	-.89077	7.39146	8.149	-.07429	1.219	.489	.800	.5740	-.0207	.326	1.000
15.625	29.358	-.65859	7.42686	9.207	-.08311	1.243	.542	.815	.5478	-.0240	.319	1.000
15.750	29.593	-.42742	7.46824	11.475	-.25341	1.293	.655	.848	.4904	-.0286	.311	1.000
15.812	29.711	-.31263	7.49304	12.773	-.13315	1.326	.729	.870	.4503	-.0318	.307	1.000
15.875	29.828	-.19859	7.52100	15.331	-.62589	1.372	.830	.900	.3908	-.0358	.302	1.000
15.906	29.887	-.14225	7.53753	17.344	-.57008	1.406	.907	.923	.3413	-.0385	.299	1.000
15.938	29.945	-.08650	7.55595	19.196	-.53153	1.445	.994	.948	.2765	-.0417	.295	1.000
15.969	30.004	-.03152	7.57654	22.299	-1.31141	1.488	1.089	.976	.1862	-.0457	.291	1.000
15.984	30.033	-.00461	7.58827	24.980	-1.87318	1.513	1.146	.993	.1013	-.0482	.289	1.000
16.000	30.063	.02161	7.60147	73.825	4.74624	1.524	1.170	1.000	0.0000	-.0511	.287	1.000

TT/TTO = 1.000

ADDITIVE DRAG = -.0511

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=EXT . STREAMLINE COORDINATE, XI2= 8.000.

XI1	S1W	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
16.000	0.000	.02161	7.60147	73.825	4.74624	1.524	1.170	1.000	0.0000	-.0511	.287	1.000
16.023	.027	.01036	7.62606	110.415	5.62778	1.508	1.134	.989	.1235	-.0564	.282	1.000
16.047	.054	.00298	7.65207	101.130	6.23003	1.430	.959	.938	.3040	-.0615	.277	1.000
16.070	.081	.00004	7.67891	91.170	6.30003	1.278	.620	.838	.5086	-.0655	.272	1.000
16.094	.108	.00481	7.70540	67.557	14.43378	.962	-.085	.631	.8383	-.0669	.267	1.000
16.117	.135	.01907	7.72825	50.004	8.46415	.842	-.352	.552	.9611	-.0659	.263	1.000
16.129	.149	.02830	7.73815	44.231	6.69059	.733	-.597	.481	1.0791	-.0650	.261	1.000
16.141	.162	.03837	7.74717	39.698	5.23624	.500	-1.117	.328	1.3700	-.0636	.259	1.000
16.152	.176	.04907	7.75546	35.920	4.46516	.322	-1.514	.211	1.6726	-.0615	.257	1.000
16.164	.189	.06024	7.76308	32.777	3.63523	1.006	.014	.660	.7936	-.0604	.256	1.000
16.176	.203	.07178	7.77015	30.277	2.80044	.796	-.456	.522	1.0101	-.0601	.255	1.000
16.187	.216	.08359	7.77675	26.253	2.41360	.695	-.681	.456	1.1215	-.0594	.253	1.000
16.211	.244	.10778	7.78886	25.125	1.61760	.400	-1.339	.263	1.5252	-.0570	.251	1.000
16.234	.271	.13249	7.79991	23.123	1.13586	.591	-.914	.387	1.2473	-.0546	.249	1.000
16.258	.298	.15752	7.81020	21.680	.80279	.865	-.300	.568	.9368	-.0534	.247	1.000
16.281	.325	.18277	7.81993	20.481	.70271	.887	-.251	.582	.9143	-.0529	.245	1.000
16.328	.379	.23379	7.83797	18.557	.53773	.785	-.480	.515	1.0218	-.0516	.242	1.000
16.352	.406	.25951	7.84640	17.787	.45463	.717	-.631	.471	1.0960	-.0507	.240	1.000
16.363	.419	.27240	7.85050	17.445	.45765	.546	-1.013	.358	1.3051	-.0501	.239	1.000
16.375	.433	.28532	7.85452	17.102	.42471	.924	-.170	.606	.8772	-.0496	.238	1.000
16.422	.487	.33721	7.86990	15.990	.29250	.831	-.377	.545	.9727	-.0488	.235	1.000
16.469	.541	.38935	7.88444	15.205	.22856	.846	-.344	.555	.9573	-.0478	.233	1.000
16.563	.649	.49409	7.91176	14.139	.14149	.854	-.326	.560	.9489	-.0460	.227	1.000
16.750	.866	.70473	7.96174	12.608	.11132	.866	-.298	.568	.9360	-.0429	.217	1.000
17.125	1.299	1.12918	8.04712	10.371	.06332	.880	-.269	.577	.9222	-.0381	.201	1.000
17.500	1.732	1.55596	8.12014	9.151	.03895	.893	-.238	.586	.9083	-.0344	.186	1.000
17.875	2.165	1.98398	8.18553	8.224	.03813	.897	-.231	.588	.9049	-.0313	.173	1.000
18.250	2.598	2.41301	8.24387	7.289	.03389	.899	-.225	.590	.9023	-.0286	.161	1.000
18.625	3.031	2.84288	8.29575	6.530	.02139	.908	-.206	.596	.8932	-.0264	.150	1.000
19.000	3.464	3.27329	8.34292	6.018	.01426	.919	-.181	.603	.8821	-.0245	.141	1.000
19.750	4.330	4.13503	8.42831	5.328	.01201	.928	-.160	.609	.8724	-.0215	.123	1.000
20.500	5.196	4.99765	8.50451	4.779	.01001	.935	-.145	.614	.8654	-.0190	.107	1.000
22.000	6.928	6.72462	8.63543	3.925	.00777	.939	-.137	.616	.8618	-.0152	.079	1.000
25.000	10.392	10.18299	8.82969	2.565	.00619	.945	-.123	.620	.8555	-.0097	.037	1.000
28.000	13.856	13.64477	8.94877	1.386	.00586	.949	-.114	.622	.8517	-.0066	.011	1.000
34.000	20.783	20.57221	9.00000	.000	-.00000	.984	-.035	.646	.8157	-.0058	.000	1.000
40.000	27.711	27.50000	9.00000	.000	.00000	.998	-.005	.654	.8024	-.0058	.000	1.000

TT/TTO = 1.000

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=EXT , STREAMLINE COORDINATE, XI2= 16.000.

XI1	S1W	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.17273	60.02523	.163	-.00000	1.002	.005	.657	.7979	0.0000	-43.482	1.000
4.000	7.483	-22.68950	60.04721	.179	-.00007	1.002	.004	.657	.7983	.0001	-43.514	1.000
8.000	14.873	-15.29974	60.07233	.211	-.00008	1.001	.003	.657	.7986	.0003	-43.552	1.000
10.000	18.512	-11.66055	60.08624	.227	-.00008	1.001	.003	.657	.7988	.0003	-43.572	1.000
12.000	22.069	-8.10430	60.10082	.242	-.00007	1.001	.002	.657	.7990	.0004	-43.594	1.000
14.000	25.475	-4.69819	60.11557	.253	-.00005	1.001	.001	.656	.7994	.0004	-43.616	1.000
16.000	28.341	-1.83227	60.12842	.260	-.00003	1.000	.001	.656	.7997	.0004	-43.635	1.000
19.000	32.242	2.06871	60.14627	.263	.00000	1.000	-.000	.656	.8001	.0004	-43.661	1.000
22.000	35.963	5.78989	60.16327	.260	.00003	1.000	-.001	.656	.8005	.0004	-43.687	1.000
25.000	39.645	9.47239	60.17971	.251	.00005	.999	-.002	.655	.8009	.0004	-43.711	1.000
28.000	43.308	13.13514	60.19540	.240	.00006	.999	-.003	.655	.8012	.0003	-43.734	1.000
34.000	50.480	20.30722	60.22375	.213	.00007	.998	-.004	.655	.8017	.0002	-43.777	1.000
40.000	57.461	27.28815	60.24851	.198	.00000	.998	-.005	.654	.8024	.0000	-43.813	1.000

TT/TTO = 1.000

INTEGRAL MOMENTUM BALANCE, CHN=EXT (AXIAL FORCES ONLY)

ENTERING MOMENTUM	=	9999.0358
LOWER BOUNDARY PRESSURE FORCE	=	-.6582
UPPER BOUNDARY PRESSURE FORCE	=	.0052
SUM OF ABOVE		9998.3828
LEAVING MOMENTUM	=	9998.9977
ERROR	=	-.6149

```
      EXECUTING PROGM=STC
     TAPIN= T     TAPOT= T

THE FAR FIELD INTERFACE BOUNDARY IS AT R=   60.000 BETWEEN Z=  -30.000 AND   28.000.   (BDY=FF     )

   *EXTENDED FAR FIELD BOUNDARY*
    Z=   -44.500   R=    60.000
    Z=    42.500   R=    60.276
```

GRID REFINEMENT		INNER ITERATIONS		SOLUTION HISTORY ORTHOGONALIZATION			FLOW BALANCE		MATRIX SOLUTION		TIME
NREFIN	GRID PTS	INRCTR	CNVF	RMS-DS1 (BEFORE	MAX-DS1 DAMPING)	MAX-DS1 (AFTER)	LIM-ES2	MAX-ES2	MAX-DS2	NSWEEPS	(SEC)
12	1091	1	1.00	.001191	.008416	.007780	.027632	.021713	.002643	28	244.659
12	1091	2	1.00	.002345	.012483	.011109	.027632	.015962	.002302	26	262.024
12	1091	3	1.00	.001450	.008367	.007738	.027632	.007618	.001423	28	280.149
12	1091	4	1.00	.000975	.004940	.004717	.027632	.004345	.000743	28	298.282

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IDENT=  NASA INLET CONFIGURATION NO. 8

GENERAL INPUT-

     AXI    =       T                    MACHO =   .8000
     RG     =    1.00                    TSO   =    1.00
     GAM    =  1.4000                    PSO   =   1.000
     TTE    =   0.000                    PTO   =    1.52
     CHOTST=        T                    TTO   =   1.128

STREAMLINE END CONDITIONS-
     NBCIN =        2         2
     ACF   =    0.000     0.000

CURVATURE CALCULATION FOR SUPERSONIC FLOW-
     SSFML =        1    (FORMULA NUMBER)
     SSFEND=     .750    (DOWNSTREAM END CONDITION, SSFML=2 ONLY)
     SSFND1=     .750    (UPSTREAM END CONDITION, SSFML=2 ONLY)
     SSFANG=    0.000    (INLET FLOW ANGLE, DEGREES, SSEF=T ONLY)

SUBSONIC/SUPERSONIC BRANCH SELECTION-
     SSEF  =        F    (SUPERSONIC ENTERING FLOW, T OR F)
     SSDF  =        F    (SUPERSONIC FLOW DOWNSTREAM OF CHOKE STATION, T OR F)
     SSDLE =        F    (SUPERSONIC FLOW BELOW AND AFT OF A L.E. POINT, T OR F)

GRID SIZE CRITERIA-
     NGR/GR=     0.00      7.00      8.50      8.51     10.00     20.00
     SGR   =     3.00      1.00       .40      1.00      3.00     12.00

     NGZ/GZ=   -15.00     -2.00       .75      3.00      5.00     12.00
     SGZ   =    12.00      1.00      1.00       .40      7.00     15.00

     VMG1  =      .10                           VMG2  =       .10

     CRX   =     .375      .375      .125     0.000     0.000     0.000

MEMORY UTILIZATION-
                          USED    AVAILABLE
     GRID POINTS          1091      1500
     TABLES               1869      3070
     STREAMLINES            44       128

CONVERGENCE DATA-
     MAXIT =         12   (MAXIMUM ITERATIONS)
     NREFIN=         12 - NUMBER OF REFINEMENT ITERATIONS
     INRCTR=          4 - NUMBER OF ADDITIONAL ITERATIONS AFTER LAST REFINEMENT

     TOLINR= 5.0E-02    (INNER ITERATION TOLERANCE ON S.L. MOVEMENT)
     TOLES2= 1.0E-03    (FINAL TOLERANCE ON S.L. MOVEMENT)
     CLEN  =    4.733 - CHARACTERISTIC LENGTH BASED ON GRID SIZE CRITERIA
              4.7E-03 - ABSOLUTE TOLERANCE ON S.L. MOVEMENT
     MAXES2= 4.3E-03 - LARGEST S.L. MOVEMENT ON LAST ITERATION

     DSIDMP=     .020   (STREAMWISE PT MOVEMENT DAMPING, =0 FOR NO DAMPING)
     NODENS=        0   (REFINEMENT LEVEL TO WHICH CONSTANT DENSITY IS ASSUMED)
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IDENT=  NASA INLET CONFIGURATION NO. 8

SPECIAL BOUNDARY OPTIONS-
     FARFLD=  FF

MATRIX SOLUTION PARAMETERS-
     IADM  =        0    (=-1,0,1, FOR STREAMLINE, ALTERNATING, AND ORTHOGONAL LINE RELAXATION)
     RHOBAS=     .500    (ACCELERATION FACTOR, BASE LEVEL)
     RHOAMP=     .500    (ACCELERATION FACTOR, AMPLITUDE OF VARIATION)
     TOLRL = 1.0E-03     (TOLERANCE RELATIVE TO MAXDS2)


     HIGHLIGHT RADIUS=   7.682    HIGHLIGHT AREA= 185.395
     MAX. BODY RADIUS=   9.000    MAX. BODY AREA= 254.469

CONTENTS OF CHANNEL TABLE-

     CHN   =  W2           WTFLOW=  1.0000E+15
     TTO   =*0000.00       PTO    =*000.000       TSO    =*0000.00      PSO    =*000.000
     MACHO =*00.0000       AO     =  8.0930E-01 VARY  =         T
     RG    =*0000.00       GAM    =*00.0000

CHANNEL FLOW RATES, PRESSURES, AND TEMPERATURES-

               SPECIFIED      ADJUSTED         PT/PSO        TT/TSO
     W2          47.7593       47.7593         1.5243        1.1280
     EXT       3552.2407     3552.2407         1.5243        1.1280
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IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 0.000** CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-29.99559	0.00000	0.000	0.00000	1.002	.657	.887	.005	.7979	0.000	1.000
2.000	.250	-29.99671	3.45687	.037	.00000	1.002	.657	.887	.005	.7979	37.542	1.000
4.000	.500	-29.99784	4.88875	.053	-.00000	1.002	.657	.887	.005	.7979	75.084	1.000
8.000	1.000	-30.00007	6.91374	.074	0.00000	1.002	.657	.887	.005	.7979	150.167	1.000
8.000	.013	-30.00007	6.91374	.074	0.00000	1.002	.657	.887	.005	.7979	150.167	1.000
8.125	.029	-30.00525	10.16614	.106	-.00000	1.002	.657	.887	.005	.7979	324.685	1.000
8.250	.044	-30.01016	12.60560	.127	.00000	1.002	.657	.887	.005	.7979	499.203	1.000
8.500	.075	-30.01972	16.43175	.157	-.00000	1.002	.657	.887	.005	.7979	848.237	1.000
9.000	.137	-30.03719	22.18568	.192	.00000	1.002	.657	.887	.005	.7979	1546.306	1.000
10.000	.260	-30.06797	30.60405	.219	-.00000	1.002	.657	.887	.005	.7979	2942.440	1.000
11.000	.383	-30.09324	37.16195	.222	.00000	1.002	.657	.887	.005	.7979	4338.573	1.000
12.000	.507	-30.11457	42.72486	.215	.00000	1.002	.657	.887	.005	.7979	5734.707	1.000
14.000	.753	-30.14812	52.09818	.192	.00000	1.002	.657	.887	.005	.7979	8526.976	1.000
16.000	1.000	-30.17272	60.02524	.163	.00000	1.002	.657	.887	.005	.7979	11319.250	1.000

SUM-VM*COS(PHI)*DFLOW = 10109.76
SUM-(P-PSO)*COS(PHI)*DA = 23.71
TOT AXIAL MOMENTUM FLUX = 10133.47

SUM-VM*SIN(PHI)*DFLOW = 34.13
SUM-(P-PSO)*SIN(PHI)*DA = .08
TOTAL Y-MOMENTUM FLUX = 34.21

STATION COORDINATE, XI1= 4.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-22.47846	0.00000	0.000	0.00000	1.010	.662	.889	.022	.7902	0.000	1.000
2.000	.250	-22.47997	3.46233	.050	-.00006	1.010	.662	.889	.022	.7903	37.661	1.000
4.000	.500	-22.48147	4.89643	.070	-.00008	1.010	.662	.889	.021	.7904	75.320	1.000
8.000	1.000	-22.48443	6.92448	.097	-.00011	1.009	.662	.889	.021	.7905	150.634	1.000
8.000	.013	-22.48443	6.92448	.097	-.00011	1.009	.662	.889	.021	.7905	150.634	1.000
8.125	.029	-22.49121	10.18151	.140	-.00016	1.009	.662	.889	.020	.7909	325.667	1.000
8.250	.044	-22.49784	12.62413	.171	-.00020	1.009	.662	.889	.019	.7913	500.671	1.000
8.500	.075	-22.51060	16.45455	.208	-.00024	1.008	.661	.889	.018	.7921	850.593	1.000
9.000	.137	-22.53353	22.21314	.246	-.00025	1.007	.660	.888	.015	.7934	1550.136	1.000
10.000	.260	-22.57166	30.53470	.265	-.00021	1.005	.659	.888	.011	.7951	2948.338	1.000
11.000	.383	-22.60156	37.19252	.257	-.00016	1.004	.658	.887	.008	.7962	4345.712	1.000
12.000	.507	-22.62581	42.75416	.242	-.00012	1.003	.658	.887	.007	.7969	5742.574	1.000
14.000	.753	-22.66273	52.12403	.209	-.00008	1.002	.657	.887	.005	.7978	8535.437	1.000
16.000	1.000	-22.68958	60.04721	.179	-.00007	1.002	.657	.887	.004	.7983	11327.539	1.000

STATION COORDINATE, XI1= 8.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-14.95078	0.00000	0.000	0.00000	1.024	.672	.893	.054	.7754	0.000	1.000
1.000	.125	-14.95355	2.45626	.118	-.00010	1.024	.672	.893	.055	.7754	18.954	1.000
2.000	.250	-14.95591	3.47365	.146	-.00039	1.024	.672	.893	.054	.7756	37.907	1.000
4.000	.500	-14.96034	4.91223	.204	-.00054	1.024	.672	.892	.053	.7762	75.807	1.000
8.000	1.000	-14.96881	6.94608	.277	-.00073	1.023	.671	.892	.050	.7773	151.576	1.000
8.000	.013	-14.96881	6.94608	.277	-.00073	1.023	.671	.892	.050	.7773	151.576	1.000
8.063	.021	-14.97893	8.73297	.357	-.00040	1.022	.670	.892	.049	.7780	239.593	1.000
8.125	.029	-14.98830	10.21133	.367	-.00089	1.021	.670	.892	.047	.7789	327.578	1.000
8.250	.044	-15.00488	12.65895	.414	-.00093	1.019	.668	.891	.042	.7808	503.437	1.000
8.500	.075	-15.03443	16.49475	.456	-.00092	1.016	.666	.891	.036	.7840	854.754	1.000
9.000	.137	-15.08084	22.25688	.464	-.00077	1.012	.664	.889	.026	.7883	1556.246	1.000
10.000	.260	-15.14626	30.67731	.412	-.00048	1.007	.661	.888	.016	.7930	2956.545	1.000
11.000	.383	-15.18988	37.23146	.356	-.00031	1.005	.659	.888	.011	.7952	4354.818	1.000
12.000	.507	-15.22232	42.78952	.312	-.00021	1.003	.658	.887	.008	.7965	5752.077	1.000
14.000	.753	-15.26796	52.15358	.252	-.00012	1.002	.657	.887	.005	.7979	8545.118	1.000
16.000	1.000	-15.29995	60.07234	.211	-.00008	1.001	.657	.887	.003	.7986	11337.020	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 10.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-11.17825	0.00000	0.000	0.00000	1.041	.683	.897	.092	.7585	0.000	1.000
1.000	.125	-11.18249	2.46601	.198	-.00064	1.040	.683	.897	.090	.7592	19.105	1.000
2.000	.250	-11.18677	3.48717	.283	-.00089	1.040	.682	.896	.089	.7599	38.203	1.000
4.000	.500	-11.19526	4.93081	.382	-.00112	1.039	.681	.896	.086	.7611	76.381	1.000
8.000	1.000	-11.21107	6.97113	.514	-.00148	1.036	.680	.896	.081	.7634	152.671	1.000
8.000	.013	-11.21107	6.97113	.514	-.00148	1.036	.680	.896	.081	.7634	152.671	1.000
8.063	.021	-11.22875	8.76265	.603	-.00189	1.034	.678	.895	.075	.7660	241.224	1.000
8.125	.029	-11.24505	10.24386	.663	-.00186	1.031	.677	.894	.070	.7684	329.669	1.000
8.250	.044	-11.27509	12.69470	.721	-.00195	1.027	.674	.893	.061	.7724	506.285	1.000
8.500	.075	-11.32388	16.53254	.741	-.00176	1.021	.670	.892	.047	.7787	858.676	1.000
9.000	.137	-11.39678	22.29292	.673	-.00121	1.014	.665	.890	.031	.7861	1561.290	1.000
10.000	.260	-11.46227	30.70712	.524	-.00059	1.007	.661	.888	.016	.7927	2962.292	1.000
11.000	.383	-11.53734	37.25625	.423	-.00034	1.005	.659	.888	.010	.7953	4360.618	1.000
12.000	.507	-11.57463	42.81082	.358	-.00023	1.003	.658	.887	.007	.7967	5757.806	1.000
14.000	.753	-11.62638	52.17036	.276	-.00012	1.002	.657	.887	.004	.7981	8550.617	1.000
16.000	1.000	-11.66093	60.08625	.227	-.00008	1.001	.657	.887	.003	.7988	11342.274	1.000

STATION COORDINATE, XI1= 12.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-7.37215	0.00000	0.000	0.00000	1.072	.703	.904	.161	.7274	0.000	1.000
.500	.062	-7.37858	1.75871	.386	-.00051	1.072	.703	.904	.161	.7273	9.717	1.000
1.000	.125	-7.38416	2.48708	.488	-.00203	1.071	.703	.904	.159	.7280	19.433	1.000
2.000	.250	-7.39470	3.51649	.665	-.00262	1.069	.702	.904	.155	.7299	38.848	1.000
4.000	.500	-7.41415	4.97036	.912	-.00378	1.066	.699	.903	.146	.7339	77.611	1.000
6.000	.750	-7.43450	6.08432	1.150	-.00208	1.063	.697	.902	.140	.7366	116.298	1.000
8.000	1.000	-7.45362	7.02250	1.162	-.00454	1.061	.696	.902	.135	.7389	154.929	1.000
8.000	.013	-7.45362	7.02250	1.162	-.00454	1.061	.696	.902	.135	.7389	154.929	1.000
8.063	.021	-7.49213	8.82181	1.312	-.00473	1.054	.691	.900	.120	.7458	244.492	1.000
8.125	.029	-7.52750	10.30694	1.392	-.00498	1.048	.687	.898	.107	.7518	333.741	1.000
8.250	.044	-7.58762	12.76004	1.397	-.00445	1.038	.681	.896	.085	.7616	511.510	1.000
8.500	.075	-7.67674	16.59447	1.253	-.00314	1.026	.673	.893	.057	.7741	865.121	1.000
9.000	.137	-7.78849	22.34403	.964	-.00160	1.014	.665	.890	.032	.7857	1568.458	1.000
10.000	.260	-7.90287	30.74364	.646	-.00061	1.007	.660	.888	.015	.7933	2969.343	1.000
11.000	.383	-7.96818	37.28477	.492	-.00033	1.004	.659	.888	.009	.7959	4367.298	1.000
12.000	.507	-8.01090	42.83447	.402	-.00021	1.003	.658	.887	.006	.7972	5764.168	1.000
14.000	.753	-8.06769	52.18824	.299	-.00010	1.002	.657	.887	.003	.7985	8556.482	1.000
16.000	1.000	-8.10485	60.10084	.242	-.00007	1.001	.657	.887	.002	.7990	11347.780	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 13.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-5.45249	0.00000	0.000	0.00000	1.099	.721	.911	.221	.7000	0.000	1.000
.500	.062	-5.46013	1.77341	.518	-.00189	1.098	.720	.910	.218	.7014	9.880	1.000
1.000	.125	-5.46823	2.50743	.737	-.00250	1.096	.719	.910	.215	.7026	19.752	1.000
2.000	.250	-5.48397	3.54441	1.038	-.00418	1.094	.717	.909	.209	.7054	39.467	1.000
3.000	.375	-5.50039	4.33912	1.303	-.00242	1.092	.716	.909	.204	.7075	59.150	1.000
4.000	.500	-5.51624	5.00842	1.417	-.00550	1.090	.715	.909	.200	.7096	78.805	1.000
6.000	.750	-5.54654	6.12904	1.659	-.00734	1.084	.711	.907	.187	.7153	118.014	1.000
8.000	1.000	-5.57534	7.07103	1.872	-.00864	1.078	.707	.906	.174	.7213	157.078	1.000
8.000	.097	-5.57534	7.07103	1.872	-.00864	1.078	.707	.906	.174	.7213	157.078	1.000
8.031	.125	-5.60887	8.02514	2.086	-.00452	1.074	.704	.905	.164	.7257	202.328	1.000
8.063	.154	-5.63968	8.87505	2.064	-.00943	1.069	.701	.904	.154	.7306	247.452	1.000
8.125	.210	-5.69352	10.36176	2.091	-.00833	1.058	.694	.901	.130	.7414	337.300	1.000
8.250	.323	-5.78165	12.81257	1.974	-.00668	1.043	.684	.897	.096	.7567	515.730	1.000
8.500	.549	-5.90090	16.63869	1.613	-.00392	1.026	.673	.893	.058	.7738	869.737	1.000
9.000	1.000	-6.03815	22.37591	1.122	-.00156	1.013	.665	.890	.029	.7867	1572.936	1.000

STATION COORDINATE, XI1= 13.500 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-4.48424	0.00000	0.000	0.00000	1.114	.731	.914	.254	.6847	0.000	1.000
.500	.062	-4.49358	1.78299	.616	-.00165	1.113	.730	.914	.252	.6858	9.987	1.000
1.000	.125	-4.50322	2.52101	.877	-.00255	1.112	.729	.914	.249	.6869	19.966	1.000
2.000	.250	-4.52238	3.56369	1.256	-.00373	1.109	.728	.913	.244	.6893	39.898	1.000
3.000	.375	-4.54204	4.36256	1.530	-.00582	1.107	.726	.913	.238	.6922	59.791	1.000
4.000	.500	-4.56114	5.03484	1.769	-.00736	1.103	.724	.912	.230	.6956	79.638	1.000
5.000	.625	-4.58096	5.62614	2.035	-.00410	1.101	.722	.911	.225	.6982	99.442	1.000
6.000	.750	-4.60027	6.15999	2.103	-.00902	1.098	.720	.911	.219	.7010	119.209	1.000
8.000	1.000	-4.63652	7.10549	2.330	-.00840	1.091	.716	.909	.203	.7081	158.612	1.000
8.000	.463	-4.63652	7.10549	2.330	-.00840	1.091	.716	.909	.203	.7081	158.612	1.000
8.031	.597	-4.67683	8.06195	2.492	-.01068	1.084	.711	.907	.187	.7154	204.188	1.000
8.063	.731	-4.71484	8.91264	2.604	-.01094	1.077	.706	.905	.171	.7227	249.553	1.000
8.125	1.000	-4.78277	10.39892	2.609	-.01151	1.063	.698	.902	.141	.7362	339.724	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 14.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-3.51183	0.00000	0.000	0.00000	1.130	.742	.918	.291	.6677	0.000	1.000
.500	.062	-3.52215	1.79410	.688	-.00096	1.130	.741	.918	.290	.6682	10.112	1.000
1.000	.125	-3.53309	2.53691	.991	-.00157	1.129	.741	.918	.289	.6689	20.219	1.000
2.000	.250	-3.55495	3.58656	1.447	-.00318	1.128	.740	.917	.285	.6707	40.412	1.000
3.000	.375	-3.57826	4.39086	1.826	-.00491	1.125	.738	.917	.280	.6730	60.569	1.000
4.000	.500	-3.60139	5.06778	2.157	-.00676	1.122	.736	.916	.273	.6759	80.684	1.000
5.000	.625	-3.62572	5.66287	2.424	-.01010	1.119	.734	.915	.265	.6796	100.745	1.000
6.000	.750	-3.64903	6.19952	2.688	-.01242	1.114	.731	.914	.255	.6842	120.744	1.000
7.000	.875	-3.67416	6.69171	3.013	-.00773	1.111	.729	.914	.247	.6878	140.677	1.000
8.000	1.000	-3.69807	7.14886	3.054	-.01851	1.107	.726	.913	.238	.6920	160.555	1.000
8.000	.013	-3.69807	7.14886	3.054	-.01851	1.107	.726	.913	.238	.6920	160.555	1.000
8.016	.015	-3.72640	7.64431	3.347	-.00960	1.102	.723	.912	.228	.6966	183.581	1.000
8.031	.017	-3.75313	8.10804	3.302	-.01989	1.097	.720	.910	.217	.7018	206.529	1.000
8.047	.019	-3.77921	8.54515	3.500	-.00962	1.092	.716	.909	.206	.7069	229.398	1.000
8.063	.021	-3.80414	8.95967	3.375	-.01859	1.088	.713	.908	.195	.7116	252.194	1.000
8.125	.029	-3.89010	10.44462	3.279	-.01462	1.068	.701	.903	.152	.7313	342.717	1.000
8.250	.044	-4.02167	12.88495	2.780	-.00930	1.045	.685	.898	.099	.7551	521.573	1.000
8.500	.075	-4.17591	16.69306	1.997	-.00385	1.024	.672	.893	.054	.7757	875.430	1.000
9.000	.137	-4.34044	22.41140	1.273	-.00152	1.011	.664	.889	.026	.7885	1577.931	1.000
10.000	.260	-4.47432	30.78565	.754	-.00050	1.005	.659	.888	.011	.7950	2977.464	1.000
11.000	.383	-4.55253	37.31589	.550	-.00026	1.003	.658	.887	.007	.7970	4374.591	1.000
12.000	.507	-4.59818	42.85952	.438	-.00016	1.002	.657	.887	.004	.7980	5770.913	1.000
14.000	.753	-4.66060	52.20659	.317	-.00008	1.001	.657	.887	.002	.7989	8562.498	1.000
16.000	1.000	-4.69911	60.11558	.253	-.00005	1.001	.656	.887	.001	.7994	11353.350	1.000

STATION COORDINATE, XI1= 14.500 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-2.54305	0.00000	0.000	0.00000	1.146	.752	.922	.326	.6516	0.000	1.000
.500	.062	-2.55423	1.80599	.708	.00026	1.146	.752	.922	.327	.6513	10.247	1.000
1.000	.125	-2.56550	2.55411	1.029	.00021	1.146	.752	.922	.327	.6512	20.494	1.000
2.000	.250	-2.58924	3.61201	1.546	-.00039	1.146	.752	.922	.327	.6512	40.987	1.000
3.000	.375	-2.61431	4.42342	2.016	-.00196	1.146	.752	.922	.326	.6518	61.471	1.000
4.000	.500	-2.64110	5.10677	2.474	-.00473	1.144	.751	.921	.322	.6534	81.930	1.000
5.000	.625	-2.66933	5.70771	2.927	-.00825	1.142	.749	.921	.316	.6561	102.347	1.000
6.000	.750	-2.69910	6.24959	3.337	-.01141	1.138	.747	.920	.308	.6599	122.702	1.000
7.000	.875	-2.72947	6.74625	3.677	-.01675	1.133	.743	.919	.297	.6650	142.980	1.000
8.000	1.000	-2.76041	7.20676	3.993	-.01639	1.128	.740	.917	.285	.6707	163.166	1.000
8.000	.177	-2.76041	7.20676	3.993	-.01639	1.128	.740	.917	.285	.6707	163.166	1.000
8.016	.203	-2.79620	7.70489	4.226	-.02331	1.120	.735	.916	.268	.6782	186.501	1.000
8.031	.228	-2.83139	8.17003	4.412	-.02203	1.112	.730	.914	.251	.6862	209.699	1.000
8.047	.254	-2.86544	8.60758	4.473	-.02749	1.104	.725	.912	.233	.6944	232.762	1.000
8.063	.280	-2.89796	9.02164	4.501	-.02466	1.096	.719	.910	.215	.7027	255.694	1.000
8.125	.383	-3.01130	10.50132	4.148	-.01985	1.071	.702	.904	.158	.7288	346.448	1.000
8.250	.589	-3.16693	12.92996	3.256	-.01010	1.041	.683	.897	.093	.7582	525.223	1.000
8.500	1.000	-3.34712	16.72327	2.179	-.00381	1.022	.670	.892	.049	.7779	878.603	1.000

STREAMTUBE CURVATURE PROGRAM

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 14.750 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-2.06163	0.00000	0.000	0.00000	1.154	.757	.923	.343	.6437	0.000	1.000
.500	.062	-2.07184	1.81190	.690	.00100	1.154	.757	.924	.344	.6430	10.314	1.000
1.000	.125	-2.08303	2.56270	1.006	.00144	1.155	.758	.924	.346	.6424	20.632	1.000
2.000	.250	-2.10573	3.62502	1.527	.00175	1.156	.758	.924	.348	.6412	41.283	1.000
3.000	.375	-2.13140	4.44053	2.026	.00120	1.157	.759	.924	.350	.6403	61.947	1.000
4.000	.500	-2.15824	5.12804	2.554	-.00108	1.157	.759	.924	.350	.6402	82.614	1.000
5.000	.625	-2.18871	5.73313	3.115	-.00536	1.156	.758	.924	.348	.6414	103.260	1.000
6.000	.750	-2.22048	6.27891	3.685	-.01390	1.152	.756	.923	.340	.6450	123.856	1.000
6.500	.812	-2.23765	6.53396	4.039	-.00940	1.150	.755	.923	.335	.6472	134.123	1.000
7.000	.875	-2.25537	6.77888	4.228	-.02368	1.148	.753	.922	.329	.6500	144.366	1.000
7.500	.937	-2.27370	7.01457	4.577	-.01450	1.144	.751	.921	.322	.6532	154.579	1.000
8.000	1.000	-2.29201	7.24193	4.675	-.03431	1.141	.749	.921	.315	.6568	164.762	1.000
8.000	.632	-2.29201	7.24193	4.675	-.03431	1.141	.749	.921	.315	.6568	164.762	1.000
8.008	.678	-2.31396	7.49660	5.031	-.01833	1.137	.746	.920	.306	.6610	176.554	1.000
8.016	.724	-2.33546	7.74199	5.052	-.03902	1.132	.743	.918	.295	.6661	188.302	1.000
8.023	.770	-2.35708	7.97884	5.328	-.02022	1.127	.739	.917	.283	.6713	200.000	1.000
8.031	.816	-2.37826	8.20796	5.244	-.04185	1.122	.736	.916	.272	.6765	211.651	1.000
8.039	.862	-2.39902	8.42999	5.444	-.01965	1.117	.733	.915	.261	.6817	223.256	1.000
8.047	.908	-2.41932	8.64555	5.298	-.03677	1.112	.730	.914	.251	.6863	234.820	1.000
8.063	1.000	-2.45710	9.05904	5.234	-.03317	1.100	.722	.911	.224	.6986	257.819	1.000

STATION COORDINATE, XI1= 15.000 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-1.58640	0.00000	0.000	0.00000	1.160	.761	.925	.358	.6367	0.000	1.000
.500	.062	-1.59626	1.81749	.654	.00170	1.161	.762	.925	.360	.6357	10.377	1.000
1.000	.125	-1.60685	2.57086	.951	.00258	1.162	.763	.925	.362	.6346	20.764	1.000
2.000	.250	-1.62860	3.63745	1.446	.00421	1.165	.764	.926	.368	.6321	41.567	1.000
3.000	.375	-1.65294	4.45716	1.936	.00536	1.167	.766	.927	.373	.6295	62.412	1.000
4.000	.500	-1.67927	5.14928	2.497	.00526	1.170	.767	.927	.379	.6269	83.300	1.000
5.000	.625	-1.70955	5.75957	3.172	.00122	1.171	.768	.927	.382	.6254	104.215	1.000
6.000	.750	-1.74357	6.31092	3.962	-.00637	1.170	.768	.927	.380	.6262	125.123	1.000
6.500	.812	-1.76238	6.56879	4.360	-.01408	1.169	.767	.927	.376	.6280	135.556	1.000
7.000	.875	-1.78212	6.81630	4.786	-.01737	1.166	.765	.926	.371	.6306	145.964	1.000
7.500	.937	-1.80284	7.05434	5.137	-.02688	1.163	.763	.926	.363	.6343	156.337	1.000
8.000	1.000	-1.82414	7.28371	5.497	-.02671	1.158	.760	.925	.354	.6386	166.669	1.000
8.000	.097	-1.82414	7.28371	5.497	-.02671	1.158	.760	.925	.354	.6386	166.669	1.000
8.008	.104	-1.84950	7.54024	5.795	-.03877	1.153	.756	.923	.341	.6446	178.616	1.000
8.016	.111	-1.87520	7.78689	6.093	-.03958	1.146	.752	.922	.326	.6515	190.492	1.000
8.023	.118	-1.90088	8.02449	6.222	-.04785	1.139	.747	.920	.310	.6590	202.295	1.000
8.031	.125	-1.92616	8.25386	6.360	-.04385	1.132	.742	.918	.294	.6666	214.025	1.000
8.039	.132	-1.95089	8.47571	6.334	-.04930	1.124	.737	.917	.277	.6742	225.685	1.000
8.047	.139	-1.97475	8.69072	6.336	-.04436	1.117	.733	.915	.261	.6817	237.280	1.000
8.063	.154	-2.02006	9.10256	6.175	-.04158	1.104	.724	.912	.231	.6951	260.302	1.000
8.125	.210	-2.16630	10.57016	5.195	-.02323	1.067	.700	.903	.150	.7321	351.005	1.000
8.250	.323	-2.35210	12.97948	3.687	-.00837	1.038	.681	.896	.084	.7621	529.255	1.000
8.500	.549	-2.54355	16.75508	2.354	-.00377	1.019	.668	.891	.042	.7809	881.948	1.000
9.000	1.000	-2.73008	22.44899	1.395	-.00114	1.009	.662	.889	.020	.7911	1583.227	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 15.250 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-1.12267	0.00000	0.000	0.00000	1.166	.765	.926	.371	.6306	0.000	1.000
.500	.062	-1.13118	1.82259	.601	.00226	1.167	.766	.927	.374	.6293	10.436	1.000
1.000	.125	-1.14104	2.57828	.869	.00357	1.169	.767	.927	.377	.6279	20.884	1.000
2.000	.250	-1.16025	3.64873	1.304	.00634	1.172	.769	.928	.384	.6244	41.825	1.000
3.000	.375	-1.18270	4.47230	1.732	.00978	1.176	.772	.929	.393	.6200	62.836	1.000
4.000	.500	-1.20589	5.16902	2.241	.01357	1.181	.775	.930	.405	.6146	83.940	1.000
5.000	.625	-1.23431	5.78524	2.946	.01533	1.187	.779	.931	.418	.6085	105.146	1.000
6.000	.750	-1.26685	6.34417	3.956	.00681	1.191	.781	.932	.427	.6042	126.444	1.000
6.500	.812	-1.28664	6.60623	4.589	-.00267	1.192	.782	.932	.428	.6038	137.106	1.000
7.000	.875	-1.30795	6.85796	5.254	-.01699	1.190	.781	.932	.424	.6054	147.754	1.000
7.500	.937	-1.33204	7.09983	5.918	-.03078	1.187	.778	.931	.416	.6091	158.360	1.000
8.000	1.000	-1.35696	7.33247	6.523	-.04957	1.181	.775	.930	.403	.6152	168.908	1.000
8.000	.301	-1.35696	7.33247	6.523	-.04957	1.181	.775	.930	.403	.6152	168.908	1.000
8.004	.312	-1.37275	7.46357	7.068	-.02733	1.178	.773	.929	.397	.6182	175.002	1.000
8.008	.323	-1.38870	7.59194	7.101	-.05958	1.174	.770	.928	.389	.6220	181.074	1.000
8.016	.345	-1.42043	7.84063	7.515	-.06880	1.164	.763	.926	.365	.6331	193.131	1.000
8.023	.366	-1.45265	8.07908	7.768	-.07161	1.152	.756	.923	.340	.6449	205.057	1.000
8.031	.388	-1.48399	8.30842	7.823	-.07079	1.141	.749	.921	.315	.6566	216.864	1.000
8.039	.410	-1.51444	8.52956	7.812	-.06801	1.130	.742	.918	.291	.6677	228.562	1.000
8.047	.432	-1.54352	8.74341	7.676	-.06325	1.120	.735	.916	.269	.6781	240.166	1.000
8.063	.476	-1.59745	9.15234	7.297	-.05044	1.103	.724	.912	.230	.6957	263.156	1.000
8.125	.650	-1.76227	10.60885	5.747	-.02427	1.062	.697	.902	.138	.7378	353.579	1.000
8.250	1.000	-1.96381	13.00514	3.874	-.00839	1.035	.679	.895	.078	.7650	531.349	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 15.500 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-.67557	0.00000	0.000	0.00000	1.171	.768	.928	.383	.6250	0.000	1.000
.500	.062	-.68279	1.82705	.539	.00256	1.173	.769	.928	.386	.6236	10.487	1.000
1.000	.125	-.69170	2.58472	.771	.00408	1.174	.770	.928	.389	.6220	20.988	1.000
2.000	.250	-.70814	3.65833	1.122	.00770	1.178	.773	.929	.398	.6179	42.045	1.000
3.000	.375	-.72749	4.48495	1.438	.01279	1.183	.776	.930	.409	.6124	63.192	1.000
4.000	.500	-.74619	5.18532	1.788	.02082	1.191	.781	.932	.425	.6049	84.470	1.000
5.000	.625	-.76891	5.80685	2.289	.03388	1.201	.788	.934	.448	.5941	105.933	1.000
6.000	.750	-.79504	6.37465	3.269	.04394	1.214	.796	.937	.477	.5801	127.662	1.000
6.500	.812	-.81234	6.64301	4.090	.03928	1.220	.800	.938	.491	.5731	138.637	1.000
7.000	.875	-.83322	6.90226	5.255	.01692	1.224	.803	.939	.501	.5684	149.669	1.000
7.500	.937	-.85941	7.15215	6.694	-.02617	1.224	.803	.939	.500	.5689	160.703	1.000
7.750	.969	-.87454	7.27343	7.566	-.02512	1.222	.802	.939	.496	.5709	166.199	1.000
8.000	1.000	-.89106	7.39216	8.191	-.07431	1.219	.800	.938	.489	.5742	171.669	1.000
8.000	.177	-.89106	7.39216	8.191	-.07431	1.219	.800	.938	.489	.5742	171.669	1.000
8.004	.183	-.91132	7.52677	8.896	-.10961	1.212	.795	.937	.473	.5821	177.978	1.000
8.008	.190	-.93251	7.65754	9.558	-.12637	1.202	.789	.934	.452	.5922	184.216	1.000
8.012	.196	-.95480	7.78467	10.282	-.06748	1.195	.784	.933	.435	.6000	190.384	1.000
8.016	.203	-.97742	7.90858	10.244	-.14351	1.187	.779	.931	.417	.6088	196.493	1.000
8.023	.216	-1.02001	8.14713	10.381	-.13651	1.163	.763	.926	.363	.6342	208.525	1.000
8.027	.222	-1.04137	8.26193	10.553	-.06426	1.155	.758	.924	.345	.6425	214.443	1.000
8.031	.228	-1.06195	8.37445	10.166	-.12048	1.147	.753	.922	.329	.6501	220.325	1.000
8.039	.241	-1.10023	8.59322	9.772	-.09512	1.131	.742	.918	.292	.6675	231.986	1.000
8.047	.254	-1.13592	8.80425	9.370	-.08018	1.117	.733	.915	.262	.6812	243.520	1.000
8.063	.280	-1.19935	9.20764	8.552	-.05853	1.096	.719	.910	.215	.7026	266.346	1.000
8.125	.383	-1.38480	10.64843	6.199	-.01731	1.056	.693	.900	.124	.7439	356.222	1.000
8.250	.589	-1.59014	13.03104	4.055	-.00841	1.031	.677	.894	.070	.7685	533.467	1.000
8.500	1.000	-1.80580	16.78634	2.492	-.00280	1.016	.666	.891	.035	.7841	885.242	1.000

STATION COORDINATE, XI1= 15.625 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
5.000	.625	-.54543	5.81490	1.826	.03842	1.201	.788	.934	.448	.5941	106.227	1.000
6.000	.750	-.56723	6.38628	2.520	.07071	1.219	.799	.938	.488	.5747	128.129	1.000
6.500	.812	-.58057	6.65808	3.245	.08764	1.231	.807	.941	.515	.5617	139.267	1.000
7.000	.875	-.59863	6.92282	4.625	.07647	1.243	.815	.943	.542	.5483	150.562	1.000
7.500	.937	-.62389	7.18021	6.819	.00776	1.249	.819	.945	.556	.5413	161.966	1.000
7.750	.969	-.64033	7.30547	8.064	-.04841	1.248	.818	.944	.553	.5427	167.667	1.000
8.000	1.000	-.65892	7.42779	9.297	-.09006	1.243	.816	.943	.543	.5477	173.328	1.000
8.000	.696	-.65892	7.42779	9.297	-.09006	1.243	.816	.943	.543	.5477	173.328	1.000
8.004	.722	-.68326	7.56573	10.569	-.14275	1.234	.810	.942	.523	.5573	179.826	1.000
8.008	.747	-.70927	7.69898	11.613	-.18935	1.222	.802	.939	.496	.5708	186.216	1.000
8.012	.772	-.73660	7.82734	12.201	-.23360	1.206	.791	.935	.460	.5882	192.477	1.000
8.016	.798	-.76356	7.95123	12.459	-.21089	1.189	.780	.932	.422	.6063	198.618	1.000
8.023	.848	-.81620	8.18771	12.212	-.17088	1.160	.761	.925	.357	.6371	210.608	1.000
8.027	.874	-.84033	8.30144	11.873	-.16060	1.147	.753	.922	.328	.6505	216.499	1.000
8.031	.899	-.86348	8.41258	11.594	-.12611	1.136	.745	.919	.304	.6620	222.335	1.000
8.039	.949	-.90634	8.62854	10.889	-.10270	1.118	.734	.915	.264	.6804	233.897	1.000
8.047	1.000	-.94529	8.83721	10.244	-.07746	1.104	.724	.912	.232	.6948	245.347	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 15.750 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	-.26422	0.00000	0.000	0.00000	1.175	.771	.928	.390	.6216	0.000	1.000
.500	.062	-.27113	1.83071	.478	.00261	1.176	.772	.929	.393	.6202	10.529	1.000
1.000	.125	-.27891	2.58992	.672	.00423	1.178	.773	.929	.397	.6184	21.073	1.000
2.000	.250	-.29333	3.66579	.938	.00781	1.182	.775	.930	.405	.6143	42.217	1.000
3.000	.375	-.30883	4.49431	1.121	.01360	1.187	.779	.931	.417	.6087	63.457	1.000
4.000	.500	-.32280	5.19660	1.255	.02309	1.195	.784	.933	.434	.6006	84.838	1.000
5.000	.625	-.33767	5.82066	1.343	.04263	1.206	.791	.935	.460	.5881	106.438	1.000
6.000	.750	-.35109	6.39400	1.530	.08903	1.227	.805	.940	.506	.5658	128.438	1.000
6.500	.812	-.35929	6.66811	1.847	.13253	1.243	.815	.943	.542	.5480	139.687	1.000
7.000	.875	-.36947	6.93827	2.822	.19743	1.266	.830	.948	.593	.5222	151.235	1.000
7.500	.937	-.38902	7.20676	5.764	.14795	1.289	.845	.953	.645	.4957	163.166	1.000
7.750	.969	-.40512	7.33967	8.359	.00513	1.294	.849	.954	.655	.4899	169.240	1.000
7.875	.984	-.41575	7.40509	9.964	-.05552	1.293	.848	.954	.654	.4908	172.271	1.000
8.000	1.000	-.42778	7.46943	11.433	-.22723	1.289	.846	.953	.645	.4952	175.277	1.000
8.000	.301	-.42778	7.46943	11.433	-.22723	1.289	.846	.953	.645	.4952	175.277	1.000
8.002	.306	-.44420	7.54236	13.398	-.16430	1.284	.842	.952	.633	.5018	178.717	1.000
8.004	.312	-.46155	7.61338	14.322	-.43390	1.273	.835	.950	.610	.5136	182.098	1.000
8.006	.317	-.48013	7.68214	15.673	-.22411	1.262	.828	.947	.585	.5266	185.402	1.000
8.008	.323	-.49890	7.74893	15.672	-.46463	1.250	.820	.945	.557	.5405	188.640	1.000
8.012	.334	-.53507	7.87712	15.830	-.37567	1.219	.800	.938	.489	.5742	194.933	1.000
8.016	.345	-.56934	7.99913	15.434	-.30773	1.194	.783	.933	.433	.6014	201.018	1.000
8.023	.366	-.63070	8.23118	14.205	-.19411	1.156	.758	.924	.348	.6412	212.850	1.000
8.027	.377	-.65824	8.34255	13.567	-.15615	1.142	.749	.921	.318	.6553	218.649	1.000
8.031	.388	-.68394	8.45163	12.956	-.13275	1.131	.742	.918	.293	.6669	224.404	1.000
8.039	.410	-.73074	8.66396	11.911	-.09656	1.114	.730	.914	.253	.6851	235.821	1.000
8.047	.432	-.77238	8.86967	11.012	-.07493	1.100	.722	.911	.224	.6986	247.152	1.000
8.063	.476	-.84431	9.26463	9.654	-.04843	1.082	.709	.907	.182	.7177	269.654	1.000
8.125	.650	-1.03997	10.68695	6.552	-.01820	1.045	.685	.898	.100	.7550	358.804	1.000
8.250	1.000	-1.26213	13.05471	4.197	-.00669	1.028	.674	.893	.062	.7721	535.408	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 15.812 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.000	.875	-.26102	6.94237	1.474	.23634	1.266	.830	.948	.593	.5222	151.414	1.000
7.500	.937	-.27454	7.21693	4.180	.33299	1.306	.857	.957	.684	.4749	163.627	1.000
7.750	.969	-.28822	7.35641	7.747	.17573	1.321	.867	.960	.717	.4567	170.013	1.000
7.875	.984	-.29924	7.42583	10.161	-.00273	1.324	.868	.960	.722	.4537	173.237	1.000
8.000	1.000	-.31298	7.49411	12.774	-.17157	1.321	.867	.960	.717	.4566	176.437	1.000
8.000	.696	-.31298	7.49411	12.774	-.17157	1.321	.867	.960	.717	.4566	176.437	1.000
8.002	.709	-.33242	7.57082	15.507	-.47338	1.311	.860	.958	.694	.4694	180.068	1.000
8.004	.722	-.35422	7.64395	17.661	-.60852	1.293	.848	.954	.654	.4905	183.563	1.000
8.006	.734	-.37710	7.71336	18.535	-.70238	1.271	.834	.949	.605	.5162	186.912	1.000
8.008	.747	-.39952	7.77968	18.836	-.59564	1.249	.819	.945	.555	.5415	190.140	1.000
8.012	.772	-.44209	7.90549	18.204	-.47622	1.210	.794	.936	.469	.5841	196.339	1.000
8.016	.798	-.48012	8.02520	17.170	-.34404	1.179	.773	.929	.400	.6171	202.331	1.000
8.023	.848	-.54671	8.25319	15.175	-.19602	1.138	.747	.920	.309	.6597	213.990	1.000
8.027	.874	-.57555	8.36310	14.344	-.16209	1.124	.737	.917	.277	.6743	219.727	1.000
8.031	.899	-.60239	8.47086	13.589	-.13066	1.112	.730	.914	.251	.6663	225.427	1.000
8.039	.949	-.65067	8.68118	12.353	-.09170	1.095	.718	.910	.211	.7044	236.759	1.000
8.047	1.000	-.69352	8.88525	11.344	-.06914	1.082	.710	.907	.183	.7173	248.022	1.000

STATION COORDINATE, XI1= 15.875 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
6.500	.812	-.16395	6.67162	.318	.14068	1.243	.815	.943	.542	.5480	139.842	1.000
7.000	.875	-.16483	6.94370	.077	.27035	1.268	.832	.949	.599	.5192	151.472	1.000
7.500	.937	-.16689	7.22229	1.220	.62466	1.321	.866	.960	.716	.4574	163.870	1.000
7.750	.969	-.17357	7.36959	4.759	.72673	1.356	.890	.967	.795	.4120	170.622	1.000
7.875	.984	-.18260	7.44602	9.127	.30756	1.369	.898	.970	.824	.3946	174.180	1.000
7.938	.992	-.18972	7.48432	11.970	-.05151	1.371	.899	.970	.828	.3924	175.977	1.000
7.969	.996	-.19404	7.50328	13.814	-.05155	1.370	.899	.970	.827	.3929	176.869	1.000
8.000	1.000	-.19891	7.52199	15.082	-.51384	1.369	.898	.970	.824	.3948	177.752	1.000
8.000	.696	-.19891	7.52199	15.082	-.51384	1.369	.898	.970	.824	.3948	177.752	1.000
8.000	.700	-.20502	7.54341	17.190	-.42989	1.366	.896	.969	.817	.3991	178.766	1.000
8.001	.703	-.21196	7.56432	19.093	-.42974	1.363	.894	.969	.811	.4028	179.758	1.000
8.002	.709	-.22661	7.60479	20.882	-1.20863	1.351	.886	.966	.784	.4185	181.687	1.000
8.004	.722	-.25732	7.67943	23.207	-1.26094	1.313	.862	.958	.700	.4661	185.271	1.000
8.006	.734	-.28671	7.74764	23.293	-1.01140	1.277	.838	.951	.618	.5097	188.577	1.000
8.008	.747	-.31391	7.81181	22.493	-.79825	1.246	.817	.944	.549	.5447	191.714	1.000
8.012	.772	-.36186	7.93371	20.559	-.48971	1.200	.787	.934	.446	.5949	197.743	1.000
8.016	.798	-.40349	8.05004	18.741	-.33631	1.169	.767	.927	.376	.6280	203.585	1.000
8.023	.848	-.47282	8.27382	15.999	-.17860	1.130	.741	.918	.289	.6687	215.061	1.000
8.027	.874	-.50284	8.38213	14.965	-.12585	1.117	.733	.915	.262	.6811	220.729	1.000
8.031	.899	-.53050	8.48862	14.157	-.13720	1.107	.726	.913	.238	.6922	226.372	1.000
8.039	.949	-.58004	8.69688	12.695	-.07299	1.090	.715	.909	.201	.7090	237.616	1.000
8.047	1.000	-.62364	8.89945	11.616	-.06400	1.080	.708	.906	.178	.7195	248.815	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 15.906 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.500	.937	-.11827	7.22255	-.629	.70251	1.321	.866	.960	.716	.4574	163.882	1.000
7.750	.969	-.11977	7.37281	1.671	1.14179	1.372	.900	.970	.829	.3913	170.772	1.000
7.875	.984	-.12522	7.45434	6.993	.97620	1.396	.916	.975	.883	.3572	174.569	1.000
7.938	.992	-.13206	7.49642	11.517	.32022	1.403	.920	.977	.899	.3468	176.546	1.000
7.969	.996	-.13681	7.51743	13.959	-.03402	1.403	.921	.977	.901	.3456	177.537	1.000
8.000	1.000	-.14246	7.53813	16.826	-.52294	1.402	.920	.976	.897	.3477	178.516	1.000
8.000	.932	-.14246	7.53813	16.826	-.52294	1.402	.920	.976	.897	.3477	178.516	1.000
8.000	.934	-.14627	7.54991	18.766	-.42548	1.401	.919	.976	.895	.3495	179.074	1.000
8.000	.937	-.15033	7.56150	19.619	-1.16127	1.398	.917	.976	.889	.3531	179.625	1.000
8.001	.941	-.15893	7.58397	22.139	-1.44595	1.391	.912	.974	.872	.3647	180.694	1.000
8.002	.949	-.17759	7.62569	25.673	-1.91941	1.369	.898	.970	.823	.3953	182.687	1.000
8.004	.966	-.21487	7.69930	27.147	-1.66784	1.316	.863	.959	.706	.4629	186.231	1.000
8.006	.983	-.24789	7.76539	25.892	-1.11262	1.271	.834	.949	.606	.5159	189.442	1.000
8.008	1.000	-.27713	7.82774	24.337	-.80812	1.239	.813	.942	.533	.5525	192.496	1.000

STATION COORDINATE, XI1= 15.938 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.000	.875	-.08648	6.94297	-1.145	.27376	1.268	.832	.949	.599	.5192	151.440	1.000
7.500	.937	-.07782	7.22152	-2.331	.76499	1.319	.865	.959	.712	.4595	163.835	1.000
7.750	.969	-.07185	7.37291	-1.818	1.54154	1.376	.903	.971	.839	.3854	170.776	1.000
7.875	.984	-.07106	7.45883	1.754	2.37567	1.417	.930	.979	.931	.3248	174.780	1.000
7.938	.992	-.07481	7.50668	7.958	1.80804	1.437	.942	.983	.975	.2922	177.029	1.000
7.969	.996	-.07944	7.53159	13.608	.24354	1.441	.946	.984	.985	.2841	178.206	1.000
7.984	.998	-.08279	7.54395	16.229	-.13363	1.441	.946	.984	.985	.2839	178.792	1.000
8.000	1.000	-.08657	7.55613	19.028	-.78494	1.440	.945	.984	.983	.2855	179.369	1.000
8.000	.696	-.08657	7.55613	19.028	-.78494	1.440	.945	.984	.983	.2855	179.369	1.000
8.000	.698	-.09180	7.56980	21.940	-1.47837	1.438	.943	.983	.977	.2905	180.019	1.000
8.000	.700	-.09741	7.58300	24.827	-1.87774	1.433	.940	.983	.968	.2976	180.648	1.000
8.001	.703	-.11017	7.60718	29.846	-3.48804	1.419	.931	.980	.935	.3216	181.801	1.000
8.002	.709	-.13583	7.64880	32.897	-3.32906	1.378	.904	.972	.844	.3826	183.796	1.000
8.004	.722	-.18028	7.71854	31.062	-1.77736	1.306	.857	.957	.683	.4753	187.163	1.000
8.006	.734	-.21586	7.78174	28.202	-1.12832	1.260	.826	.947	.580	.5291	190.240	1.000
8.008	.747	-.24676	7.84197	25.897	-.81275	1.226	.804	.940	.504	.5669	193.197	1.000
8.012	.772	-.29821	7.95876	22.386	-.44148	1.180	.774	.929	.402	.6159	198.995	1.000
8.016	.798	-.34225	8.07153	19.929	-.30160	1.151	.755	.923	.338	.6462	204.674	1.000
8.023	.848	-.41244	8.29148	16.590	-.14936	1.117	.733	.915	.262	.6811	215.980	1.000
8.027	.874	-.44347	8.39827	15.481	-.16431	1.105	.725	.912	.234	.6939	221.580	1.000
8.031	.899	-.47143	8.50371	14.440	-.02829	1.098	.720	.910	.218	.7013	227.178	1.000
8.039	.949	-.52190	8.71013	13.015	-.11163	1.086	.712	.908	.191	.7136	238.341	1.000
8.047	1.000	-.56609	8.91139	11.824	-.05975	1.070	.702	.904	.156	.7295	249.483	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 15.969 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.000	.875	-.06164	6.94239	-1.536	.27475	1.268	.832	.949	.599	.5192	151.415	1.000
7.500	.937	-.04727	7.21991	-3.687	.78210	1.320	.866	.960	.713	.4586	163.762	1.000
7.750	.969	-.03639	7.37080	-4.992	1.57298	1.377	.904	.971	.842	.3835	170.679	1.000
7.875	.984	-.02793	7.45767	-5.177	3.20277	1.425	.935	.981	.948	.3119	174.725	1.000
7.938	.992	-.02443	7.50981	-2.619	5.39891	1.460	.958	.988	1.027	.2492	177.177	1.000
7.969	.996	-.02404	7.54124	2.792	6.32288	1.480	.971	.992	1.071	.2065	178.663	1.000
7.984	.998	-.02612	7.55888	11.584	2.88141	1.487	.975	.993	1.086	.1895	179.500	1.000
8.000	1.000	-.03159	7.57670	22.169	-1.08081	1.488	.976	.993	1.089	.1862	180.348	1.000
8.000	.696	-.03159	7.57670	22.169	-1.08081	1.488	.976	.993	1.089	.1862	180.348	1.000
8.000	.698	-.04147	7.59521	34.144	-5.90316	1.482	.972	.992	1.076	.2010	181.230	1.000
8.000	.700	-.05313	7.60994	41.527	-8.92483	1.468	.963	.989	1.045	.2324	181.934	1.000
8.001	.703	-.07460	7.63277	43.102	-6.85815	1.433	.940	.982	.966	.2989	183.026	1.000
8.002	.709	-.10712	7.67005	40.302	-3.85949	1.372	.900	.970	.831	.3901	184.819	1.000
8.004	.722	-.15667	7.73356	33.812	-1.65548	1.298	.852	.955	.666	.4843	187.892	1.000
8.006	.734	-.19303	7.79442	29.863	-1.09038	1.256	.824	.946	.571	.5336	190.861	1.000
8.008	.747	-.22510	7.85274	26.956	-.71712	1.224	.803	.939	.501	.5683	193.728	1.000
8.012	.772	-.27672	7.96774	22.939	-.38809	1.185	.777	.931	.413	.6106	199.444	1.000
8.016	.798	-.32167	8.07907	20.275	-.25402	1.161	.762	.925	.359	.6361	205.056	1.000
8.023	.848	-.39110	8.29787	16.768	-.13044	1.132	.743	.918	.295	.6661	216.313	1.000
8.027	.874	-.42252	8.40411	15.616	-.06081	1.125	.738	.917	.278	.6738	221.888	1.000
8.031	.899	-.45052	8.50911	14.559	-.15475	1.116	.732	.915	.258	.6830	227.467	1.000
8.039	.949	-.50128	8.71491	13.088	-.01703	1.103	.724	.912	.231	.6954	238.603	1.000
8.047	1.000	-.54557	8.91570	11.895	-.05824	1.100	.721	.911	.223	.6991	249.724	1.000

STATION COORDINATE, XI1= 15.984 CHANNELS- W2 EXT SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.875	.984	-.01474	7.45619	-7.599	3.16500	1.425	.935	.981	.948	.3119	174.656	1.000
7.938	.992	-.00741	7.50820	-8.291	6.12728	1.461	.959	.988	1.030	.2464	177.101	1.000
7.969	.996	-.00302	7.54063	-6.721	9.32225	1.466	.975	.993	1.084	.1917	178.634	1.000
7.984	.998	-.00109	7.56157	-2.920	16.29951	1.502	.985	.996	1.121	.1451	179.628	1.000
8.000	1.000	-.00463	7.58832	24.691	-1.91520	1.511	.991	.998	1.141	.1112	180.901	1.000
8.000	.982	-.00463	7.58832	24.691	-1.91520	1.511	.991	.998	1.141	.1112	180.901	1.000
8.000	.984	-.02399	7.61046	51.196	-18.67891	1.496	.982	.995	1.108	.1634	181.958	1.000
8.000	.987	-.04057	7.62329	52.469	-11.67162	1.470	.965	.990	1.050	.2273	182.572	1.000
8.001	.991	-.06468	7.64304	48.937	-7.31674	1.429	.937	.982	.957	.3053	183.519	1.000
8.002	1.000	-.09924	7.67700	42.549	-3.59779	1.369	.898	.970	.825	.3943	185.154	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.000** CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	.01233	0.00000	0.000	0.00000	1.179	.773	.929	.398	.6176	0.000	1.000
.500	.063	.00449	1.63291	.438	.00249	1.180	.774	.929	.401	.6162	10.554	1.000
1.000	.125	-.00230	2.59301	.608	.00390	1.181	.775	.930	.405	.6146	21.123	1.000
2.000	.250	-.01687	3.67002	.817	.00743	1.185	.777	.931	.413	.6108	42.314	1.000
3.000	.376	-.02860	4.49928	.915	.01211	1.190	.781	.932	.424	.6056	63.597	1.000
4.000	.501	-.04092	5.20187	.894	.02148	1.197	.785	.933	.439	.5982	85.010	1.000
5.000	.626	-.04854	5.82574	.684	.03689	1.207	.792	.935	.462	.5872	106.623	1.000
6.000	.751	-.05415	6.39805	.042	.08548	1.226	.804	.940	.504	.5668	128.601	1.000
6.500	.814	-.05255	6.67156	-.594	.14450	1.242	.815	.943	.541	.5486	139.831	1.000
7.000	.877	-.04809	6.94200	-1.749	.27413	1.269	.832	.949	.600	.5186	151.396	1.000
7.500	.939	-.03374	7.21897	-4.239	.65484	1.319	.866	.960	.713	.4588	163.720	1.000
7.750	.971	-.02023	7.36918	-6.496	1.64742	1.375	.902	.971	.838	.3862	170.603	1.000
7.875	.986	-.00907	7.45538	-8.635	3.16113	1.424	.934	.981	.946	.3136	174.618	1.000
7.938	.994	-.00043	7.50703	-10.702	5.78527	1.460	.958	.988	1.027	.2489	177.046	1.000
7.969	.998	.00588	7.53918	-11.940	10.72271	1.486	.975	.993	1.085	.1908	178.566	1.000
7.984	1.000	.01051	7.55987	-13.678	15.57640	1.502	.986	.996	1.121	.1444	179.547	1.000

SUM-VM*COS(PHI)*DFLOW = 98.85
SUM-(P-PSO)*COS(PHI)*DA = 40.29
TOT AXIAL MOMENTUM FLUX = 139.14

SUM-VM*SIN(PHI)*DFLOW = .09
SUM-(P-PSO)*SIN(PHI)*DA = -.82
TOTAL Y-MOMENTUM FLUX = -.74

STATION COORDINATE, XI1= 16.016 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.750	.969	-.01451	7.36850	-7.033	1.61118	1.375	.902	.971	.836	.3871	170.572	1.000
7.875	.984	-.00131	7.45410	-10.103	3.32808	1.421	.932	.980	.941	.3177	174.558	1.000
7.938	.992	.00896	7.50499	-13.892	5.75277	1.459	.957	.988	1.024	.2513	176.950	1.000
7.969	.996	.01820	7.53571	-19.407	9.43997	1.484	.973	.992	1.079	.1973	178.401	1.000
7.984	.998	.02553	7.55426	-26.792	12.17439	1.498	.983	.995	1.112	.1577	179.281	1.000
8.000	1.000	.04043	7.57254	-52.792	-3.90349	1.504	.987	.996	1.126	.1370	180.149	1.000

STATION COORDINATE, XI1= 16.031 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.000	.875	-.03027	6.94142	-2.024	.26461	1.267	.831	.949	.596	.5206	151.372	1.000
7.500	.937	-.01457	7.21743	-5.013	.74430	1.316	.863	.959	.706	.4629	163.649	1.000
7.750	.969	.00259	7.36615	-8.573	1.50138	1.372	.900	.970	.830	.3909	170.463	1.000
7.875	.984	.01816	7.44999	-13.676	2.92546	1.418	.930	.979	.932	.3238	174.366	1.000
7.938	.992	.03273	7.49742	-21.111	4.29123	1.449	.951	.986	1.002	.2701	176.593	1.000
7.969	.996	.04460	7.52300	-30.238	3.29735	1.464	.960	.988	1.035	.2415	177.800	1.000
7.984	.998	.05299	7.53538	-38.149	-.52915	1.466	.962	.989	1.041	.2359	178.386	1.000
8.000	1.000	.06296	7.54644	-45.845	-3.13274	1.463	.960	.988	1.034	.2429	178.910	1.000

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STATION COORDINATE, XI1= 16.047 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.500	.937	.00567	7.21550	-5.842	.67967	1.314	.862	.958	.700	.4659	163.562	1.000
7.750	.969	.02679	7.36205	-10.623	1.41105	1.365	.895	.969	.815	.4002	170.274	1.000
7.875	.984	.04594	7.44209	-17.857	2.11751	1.404	.921	.977	.901	.3450	173.996	1.000
7.938	.992	.06266	7.48393	-26.472	1.39273	1.422	.933	.980	.941	.3172	175.958	1.000
7.969	.996	.07422	7.50428	-33.084	-.45855	1.424	.934	.981	.947	.3131	176.917	1.000
7.984	.998	.08095	7.51388	-36.696	-.71088	1.423	.933	.980	.944	.3153	177.369	1.000
8.000	1.000	.08818	7.52292	-40.439	-2.38516	1.419	.931	.980	.936	.3207	177.796	1.000

STATION COORDINATE, XI1= 16.062 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
6.500	.812	.00317	6.67077	-1.031	.12887	1.240	.813	.943	.535	.5515	139.798	1.000
7.000	.875	.01171	6.93971	-2.634	.24201	1.262	.828	.948	.586	.5260	151.298	1.000
7.500	.937	.03224	7.21255	-6.818	.59403	1.310	.859	.958	.692	.4703	163.428	1.000
7.750	.969	.05594	7.35599	-12.818	1.15996	1.355	.889	.967	.793	.4131	169.993	1.000
7.875	.984	.07772	7.43083	-20.749	.87687	1.380	.905	.972	.849	.3795	173.470	1.000
7.938	.992	.09412	7.46766	-27.683	-.19511	1.384	.908	.973	.858	.3733	175.194	1.000
7.969	.996	.10415	7.48515	-32.061	-.54665	1.382	.907	.972	.854	.3762	176.016	1.000
8.000	1.000	.11529	7.50159	-36.076	-2.02090	1.376	.903	.971	.839	.3855	176.789	1.000

STATION COORDINATE, XI1= 16.094 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
7.000	.875	.06769	6.93677	-3.341	.19814	1.256	.824	.946	.572	.5328	151.170	1.000
7.500	.937	.09567	7.20388	-8.610	.38302	1.298	.851	.955	.665	.4849	163.036	1.000
7.750	.969	.12284	7.33864	-15.668	.27871	1.317	.864	.959	.708	.4615	169.193	1.000
7.875	.984	.14496	7.40406	-21.816	-.36151	1.317	.864	.959	.708	.4617	172.222	1.000
7.938	.992	.15850	7.43525	-25.195	-1.00687	1.308	.858	.957	.687	.4728	173.677	1.000
8.000	1.000	.17351	7.46465	-28.929	-1.63441	1.289	.846	.953	.646	.4949	175.053	1.000

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STATION COORDINATE, XI1= 16.125 CHANNELS- W2 SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
4.000	.500	.12447	5.20418	.708	.01792	1.196	.785	.933	.438	.5987	85.085	1.000
5.000	.625	.11848	5.82724	.356	.03181	1.205	.790	.935	.457	.5895	106.678	1.000
6.000	.750	.11916	6.39701	-.692	.06232	1.220	.800	.938	.490	.5735	128.559	1.000
6.500	.812	.12465	6.66771	-1.809	.09467	1.231	.808	.941	.516	.5608	139.670	1.000
7.000	.875	.13793	6.93223	-4.029	.14292	1.248	.819	.944	.554	.5423	150.972	1.000
7.500	.937	.16657	7.19235	-9.711	.15194	1.269	.833	.949	.601	.5185	162.514	1.000
7.750	.969	.19446	7.31831	-15.606	-.30716	1.266	.830	.948	.593	.5221	168.257	1.000
7.875	.984	.21317	7.37823	-19.342	-.82091	1.249	.819	.945	.555	.5415	171.023	1.000
7.938	.992	.22399	7.40684	-22.034	-.53740	1.238	.812	.942	.530	.5539	172.352	1.000
8.000	1.000	.23555	7.43451	-23.108	-1.34733	1.224	.803	.939	.499	.5692	173.642	1.000

STATION COORDINATE, XI1= 16.156 CHANNELS- W2 SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
6.500	.812	.19858	6.66515	-2.144	.06351	1.225	.803	.939	.502	.5679	139.563	1.000
7.000	.875	.21372	6.92654	-4.502	.07458	1.237	.812	.942	.529	.5544	150.724	1.000
7.500	.937	.24318	7.17905	-9.794	-.11458	1.237	.812	.942	.530	.5541	161.914	1.000
7.750	.969	.26820	7.29884	-13.835	-.50306	1.218	.799	.938	.486	.5757	167.362	1.000
7.875	.984	.28339	7.35587	-16.037	-.74276	1.196	.785	.933	.438	.5986	169.988	1.000
8.000	1.000	.30014	7.41028	-18.145	-1.15462	1.163	.763	.926	.364	.6338	172.512	1.000

STATION COORDINATE, XI1= 16.187 CHANNELS- W2 SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
6.000	.750	.26891	6.39461	-1.107	.03454	1.212	.795	.937	.473	.5818	128.463	1.000
6.500	.812	.27696	6.66205	-2.356	.03048	1.217	.799	.938	.485	.5761	139.433	1.000
7.000	.875	.29203	6.92022	-4.677	.00277	1.221	.801	.939	.494	.5718	150.449	1.000
7.500	.937	.32061	7.16619	-8.939	-.26521	1.206	.791	.935	.459	.5887	161.334	1.000
7.750	.969	.34164	7.28224	-11.033	-.51667	1.178	.773	.929	.398	.6180	166.602	1.000
7.875	.984	.35369	7.33776	-12.819	-.80184	1.154	.757	.924	.344	.6433	169.152	1.000
8.000	1.000	.36645	7.39127	-13.983	-.94229	1.120	.735	.916	.269	.6781	171.628	1.000

STREAMTUBE CURVATURE PROGRAM

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.250 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	.46833	0.00000	0.000	0.00000	1.182	.775	.930	.406	.6142	0.000	1.000
.500	.062	.46064	1.83615	.377	.00213	1.183	.776	.930	.408	.6130	10.592	1.000
1.000	.125	.45500	2.59747	.513	.00332	1.184	.777	.930	.411	.6116	21.196	1.000
2.000	.250	.44239	3.67585	.645	.00566	1.187	.779	.931	.418	.6085	42.449	1.000
3.000	.375	.43417	4.50550	.640	.00859	1.191	.781	.932	.426	.6047	63.773	1.000
4.000	.500	.42590	5.20719	.454	.01144	1.195	.784	.933	.435	.6002	85.184	1.000
5.000	.625	.42477	5.82791	-.059	.01541	1.200	.787	.934	.447	.5947	106.703	1.000
6.000	.750	.42899	6.39120	-1.288	.00485	1.204	.790	.935	.455	.5906	128.326	1.000
6.500	.812	.43779	6.65526	-2.402	-.02048	1.203	.789	.935	.453	.5916	139.149	1.000
7.000	.875	.45116	6.90767	-4.160	-.11552	1.194	.783	.933	.433	.6013	149.904	1.000
7.500	.937	.47381	7.14557	-6.294	-.33135	1.162	.762	.925	.361	.6351	160.407	1.000
7.750	.969	.48689	7.25804	-7.293	-.50923	1.130	.741	.918	.290	.6685	165.496	1.000
7.875	.984	.49441	7.31239	-8.314	-.29560	1.113	.730	.914	.253	.6852	167.984	1.000
8.000	1.000	.50198	7.36567	-7.774	-.64903	1.096	.719	.910	.215	.7026	170.441	1.000

STATION COORDINATE, XI1= 16.375 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
4.000	.500	.74356	5.20923	.303	.00511	1.193	.782	.932	.430	.6024	85.251	1.000
5.000	.625	.74287	5.82710	-.177	-.00247	1.194	.783	.933	.433	.6011	106.673	1.000
6.000	.750	.74811	6.38439	-1.044	-.03153	1.189	.780	.931	.422	.6065	128.053	1.000
6.500	.812	.75413	6.64380	-1.605	-.06732	1.181	.775	.930	.405	.6147	138.670	1.000
7.000	.875	.76209	6.89073	-2.065	-.11928	1.167	.765	.926	.372	.6300	149.170	1.000
7.500	.937	.77077	7.12514	-2.048	-.16564	1.144	.751	.921	.322	.6533	159.491	1.000
7.750	.969	.77452	7.23781	-1.702	-.16522	1.131	.742	.918	.293	.6669	164.575	1.000
8.000	1.000	.77725	7.34777	-.764	-.07177	1.121	.736	.916	.271	.6770	169.614	1.000

STATION COORDINATE, XI1= 16.500 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	1.07623	0.00000	0.000	0.00000	1.186	.778	.931	.415	.6098	0.000	1.000
.500	.062	1.07090	1.83982	.316	.00140	1.187	.778	.931	.417	.6090	10.634	1.000
1.000	.125	1.06600	2.60241	.420	.00203	1.187	.779	.931	.418	.6081	21.277	1.000
2.000	.250	1.05703	3.68188	.496	.00279	1.189	.780	.932	.422	.6064	42.588	1.000
3.000	.375	1.05019	4.51115	.447	.00237	1.190	.781	.932	.425	.6049	63.933	1.000
4.000	.500	1.04552	5.21069	.267	-.00090	1.191	.781	.932	.426	.6044	85.298	1.000
5.000	.625	1.04437	5.82642	-.059	-.01112	1.189	.780	.931	.422	.6064	106.648	1.000
6.000	.750	1.04674	6.38043	-.465	-.03606	1.181	.775	.930	.405	.6146	127.894	1.000
6.500	.812	1.04922	6.63824	-.598	-.05177	1.174	.770	.928	.389	.6221	138.438	1.000
7.000	.875	1.05173	6.88451	-.552	-.06296	1.165	.764	.926	.368	.6318	148.900	1.000
7.500	.937	1.05348	7.12025	-.225	-.05933	1.155	.758	.924	.347	.6419	159.272	1.000
7.750	.969	1.05366	7.23452	.059	-.05499	1.151	.755	.923	.337	.6464	164.426	1.000
8.000	1.000	1.05324	7.34661	.236	-.05454	1.147	.752	.922	.328	.6507	169.560	1.000

STREAMTUBE CURVATURE PROGRAM

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STATION COORDINATE, XI1= 16.750   CHANNELS- W2   SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	1.65330	0.00000	0.000	0.00000	1.189	.780	.932	.422	.6062	0.000	1.000
.500	.062	1.64888	1.84281	.282	.00066	1.190	.780	.932	.423	.6058	10.669	1.000
1.000	.125	1.64445	2.60637	.372	.00084	1.190	.781	.932	.424	.6054	21.341	1.000
2.000	.250	1.63682	3.68656	.442	.00047	1.191	.781	.932	.425	.6049	42.696	1.000
3.000	.375	1.63031	4.51548	.428	-.00125	1.190	.781	.932	.425	.6050	64.056	1.000
4.000	.500	1.62556	5.21378	.367	-.00513	1.189	.780	.932	.422	.6064	85.400	1.000
5.000	.625	1.62177	5.82771	.319	-.01177	1.186	.778	.931	.415	.6097	106.695	1.000
6.000	.750	1.61859	6.38067	.412	-.01750	1.181	.775	.930	.404	.6150	127.903	1.000
6.500	.812	1.61639	6.63868	.548	-.01878	1.178	.773	.929	.397	.6181	138.465	1.000
7.000	.875	1.61369	6.88671	.763	-.01870	1.175	.771	.928	.391	.6212	148.996	1.000
7.500	.937	1.60982	7.12524	1.046	-.02037	1.172	.769	.928	.384	.6244	159.496	1.000
7.750	.969	1.60765	7.24132	1.116	-.01156	1.171	.768	.927	.381	.6257	164.735	1.000
8.000	1.000	1.60517	7.35544	1.414	-.01992	1.170	.767	.927	.379	.6268	169.968	1.000

STATION COORDINATE, XI1= 17.000   CHANNELS- W2   SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	2.21656	0.00000	0.000	0.00000	1.192	.782	.932	.429	.6031	0.000	1.000
.500	.062	2.21229	1.84551	.270	.00004	1.192	.782	.932	.429	.6030	10.700	1.000
1.000	.125	2.20802	2.60995	.360	-.00008	1.192	.782	.932	.429	.6030	21.400	1.000
2.000	.250	2.20045	3.69090	.449	-.00089	1.192	.782	.932	.429	.6033	42.797	1.000
3.000	.375	2.19357	4.51994	.486	-.00232	1.191	.781	.932	.427	.6041	64.182	1.000
4.000	.500	2.18754	5.21816	.521	-.00445	1.190	.781	.932	.424	.6056	85.543	1.000
5.000	.625	2.18152	5.83236	.601	-.00581	1.188	.779	.931	.419	.6077	106.866	1.000
6.000	.750	2.17505	6.38672	.768	-.00480	1.186	.778	.931	.415	.6097	128.146	1.000
6.500	.812	2.17130	6.64625	.889	-.00262	1.185	.778	.931	.414	.6104	138.773	1.000
7.000	.875	2.16712	6.89592	1.038	.00135	1.185	.778	.931	.413	.6105	149.394	1.000
7.500	.937	2.16239	7.13693	1.221	.00927	1.186	.778	.931	.415	.6097	160.019	1.000
8.000	1.000	2.15698	7.37033	1.496	.01471	1.188	.779	.931	.419	.6078	170.657	1.000

STATION COORDINATE, XI1= 17.250   CHANNELS- W2   SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	2.77223	0.00000	0.000	0.00000	1.195	.784	.933	.435	.6000	0.000	1.000
.500	.062	2.76780	1.84815	.277	-.00047	1.195	.784	.933	.435	.6002	10.731	1.000
1.000	.125	2.76340	2.61350	.375	-.00087	1.195	.784	.933	.434	.6006	21.458	1.000
2.000	.250	2.75530	3.69541	.485	-.00140	1.194	.783	.933	.433	.6013	42.902	1.000
3.000	.375	2.74769	4.52500	.561	-.00241	1.193	.783	.932	.431	.6023	64.326	1.000
4.000	.500	2.74046	5.22378	.634	-.00265	1.192	.782	.932	.428	.6035	85.727	1.000
5.000	.625	2.73312	5.83888	.735	-.00265	1.191	.781	.932	.426	.6046	107.105	1.000
6.000	.750	2.72545	6.39462	.854	-.00069	1.190	.781	.932	.424	.6052	128.463	1.000
6.500	.812	2.72142	6.65502	.920	.00063	1.190	.781	.932	.424	.6052	139.139	1.000
7.000	.875	2.71727	6.90563	.978	.00245	1.190	.781	.932	.425	.6050	149.815	1.000
7.500	.937	2.71303	7.14755	1.018	.00359	1.191	.781	.932	.426	.6045	160.496	1.000
8.000	1.000	2.70887	7.38163	.997	-.00013	1.191	.781	.932	.427	.6042	171.181	1.000

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STATION COORDINATE, XI1= 17.500 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	3.32855	0.00000	0.000	0.00000	1.198	.786	.933	.442	.5969	0.000	1.000
.500	.062	3.32364	1.85092	.297	-.00081	1.198	.786	.933	.441	.5974	10.763	1.000
1.000	.125	3.31891	2.61728	.408	-.00118	1.197	.785	.933	.440	.5978	21.520	1.000
2.000	.250	3.30983	3.70035	.542	-.00220	1.196	.785	.933	.437	.5991	43.017	1.000
3.000	.375	3.30144	4.53073	.619	-.00123	1.195	.784	.933	.435	.6000	64.489	1.000
4.000	.500	3.29331	5.23031	.719	-.00274	1.194	.783	.933	.434	.6009	85.942	1.000
5.000	.625	3.28514	5.84628	.792	-.00095	1.194	.783	.932	.432	.6017	107.376	1.000
6.000	.750	3.27708	6.40297	.882	-.00105	1.193	.783	.932	.431	.6020	128.799	1.000
6.500	.812	3.27297	6.66383	.917	-.00044	1.193	.783	.932	.431	.6021	139.508	1.000
7.000	.875	3.26888	6.91484	.951	-.00070	1.193	.783	.932	.431	.6022	150.215	1.000
7.500	.937	3.26481	7.15702	.971	-.00058	1.193	.783	.932	.431	.6023	160.922	1.000
8.000	1.000	3.26079	7.39125	1.001	-.00013	1.193	.783	.932	.430	.6024	171.627	1.000

STATION COORDINATE, XI1= 18.000 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	4.44541	0.00000	0.000	0.00000	1.204	.790	.935	.456	.5899	0.000	1.000
.500	.062	4.43941	1.85734	.368	-.00139	1.204	.790	.935	.455	.5907	10.838	1.000
1.000	.125	4.43352	2.62611	.509	-.00198	1.203	.789	.935	.453	.5916	21.666	1.000
2.000	.250	4.42207	3.71232	.695	-.00260	1.201	.788	.934	.450	.5931	43.295	1.000
4.000	.500	4.40059	5.24591	.897	-.00288	1.199	.786	.934	.444	.5959	86.455	1.000
6.000	.750	4.38128	6.42072	.966	-.00162	1.197	.785	.933	.440	.5977	129.514	1.000
7.000	.875	4.37264	6.93337	.963	.00031	1.197	.785	.933	.440	.5980	151.022	1.000
8.000	1.000	4.36463	7.41061	1.009	-.00013	1.197	.785	.933	.440	.5979	172.528	1.000

STATION COORDINATE, XI1= 19.000 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	6.71657	0.00000	0.000	0.00000	1.222	.802	.939	.496	.5708	0.000	1.000
.500	.062	6.70659	1.87617	.603	-.00224	1.221	.801	.939	.493	.5721	11.058	1.000
1.000	.125	6.69678	2.65235	.847	-.00323	1.220	.800	.938	.491	.5734	22.101	1.000
2.000	.250	6.67730	3.74818	1.176	-.00485	1.217	.799	.938	.485	.5760	44.136	1.000
4.000	.500	6.64012	5.29241	1.589	-.00790	1.212	.795	.937	.473	.5820	87.995	1.000
6.000	.750	6.60462	6.47075	1.831	-.01194	1.205	.791	.935	.458	.5893	131.540	1.000
8.000	1.000	6.57212	7.45788	2.070	-.01403	1.197	.786	.933	.441	.5975	174.735	1.000

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STATION COORDINATE, XI1= 20.000 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	9.02165	0.00000	0.000	0.00000	1.247	.818	.944	.551	.5434	0.000	1.000
.500	.062	9.00675	1.90632	.900	-.00227	1.246	.817	.944	.549	.5446	11.417	1.000
1.000	.125	8.99177	2.69485	1.277	-.00331	1.245	.817	.944	.546	.5459	22.815	1.000
2.000	.250	8.96174	3.80787	1.821	-.00500	1.242	.815	.943	.541	.5485	45.553	1.000
4.000	.500	8.90095	5.37544	2.621	-.00802	1.237	.812	.942	.529	.5545	90.777	1.000
6.000	.750	8.83957	6.57095	3.274	-.01057	1.231	.808	.941	.516	.5610	135.646	1.000
8.000	1.000	8.77707	7.57223	3.858	-.01321	1.225	.803	.939	.501	.5682	180.135	1.000

STATION COORDINATE, XI1= 21.000 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	11.30721	0.00000	0.000	0.00000	1.276	.837	.950	.615	.5108	0.000	1.000
.500	.062	11.28796	1.94729	1.139	-.00140	1.275	.837	.950	.614	.5115	11.913	1.000
1.000	.125	11.26853	2.75307	1.624	-.00201	1.274	.836	.950	.613	.5123	23.811	1.000
2.000	.250	11.22933	3.89105	2.336	-.00293	1.273	.835	.950	.610	.5138	47.565	1.000
4.000	.500	11.14857	5.49575	3.434	-.00458	1.270	.833	.949	.604	.5170	94.886	1.000
6.000	.750	11.06511	6.72160	4.393	-.00694	1.267	.831	.949	.596	.5208	141.937	1.000
8.000	1.000	10.97791	7.74954	5.265	-.00874	1.263	.829	.948	.587	.5253	188.670	1.000

STATION COORDINATE, XI1= 22.000 CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	13.54280	0.00000	0.000	0.00000	1.304	.855	.956	.677	.4782	0.000	1.000
.500	.062	13.52105	1.99441	1.258	-.00045	1.303	.855	.956	.677	.4784	12.496	1.000
1.000	.125	13.49908	2.82012	1.789	-.00057	1.303	.855	.956	.677	.4786	24.985	1.000
2.000	.250	13.45495	3.98716	2.559	-.00056	1.303	.855	.956	.676	.4790	49.943	1.000
4.000	.500	13.36449	5.63612	3.715	.00016	1.303	.855	.956	.675	.4792	99.795	1.000
6.000	.750	13.27187	6.90083	4.704	.00204	1.303	.855	.956	.677	.4785	149.607	1.000
8.000	1.000	13.17521	7.96680	5.858	-.00063	1.304	.855	.956	.678	.4780	199.397	1.000

STATION COORDINATE, XI1= 24.000** CHANNELS- W2 SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
0.000	0.000	17.95253	0.00000	0.000	0.00000	1.349	.885	.966	.780	.4211	0.000	1.000
.500	.062	17.92850	2.09415	1.315	.00000	1.349	.885	.966	.780	.4211	13.777	1.000
1.000	.125	17.90445	2.96140	1.861	.00000	1.349	.885	.966	.780	.4211	27.551	1.000
2.000	.250	17.85637	4.18751	2.630	.00000	1.349	.885	.966	.780	.4211	55.089	1.000
4.000	.500	17.76053	5.92050	3.695	-.00000	1.349	.885	.966	.780	.4211	110.120	1.000
6.000	.750	17.66579	7.24912	4.446	.00000	1.349	.885	.966	.779	.4213	165.090	1.000
8.000	1.000	17.57273	8.37065	4.068	.01127	1.351	.886	.966	.783	.4190	220.125	1.000

SUM-VM*COS(PHI)*DFLOW = 73.70
SUM-(P-PSO)*COS(PHI)*DA = 76.92
TOT AXIAL MOMENTUM FLUX = 150.62

SUM-VM*SIN(PHI)*DFLOW = 4.31
SUM-(P-PSO)*SIN(PHI)*DA = 4.50
TOTAL Y-MOMENTUM FLUX = 8.81

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STATION COORDINATE, XI1= 16.000** CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	.000	-.01878	7.61829	61.599	-19.91909	1.496	.981	.995	1.107	.1642	182.333	1.000
8.000	.000	-.03654	7.62904	57.463	-12.81313	1.469	.964	.989	1.047	.2304	182.848	1.000
8.001	.000	-.06136	7.64699	51.061	-7.11524	1.425	.935	.981	.948	.3120	183.709	1.000
8.002	.000	-.09563	7.68037	43.558	-3.64677	1.363	.894	.968	.809	.4035	185.317	1.000
8.004	.000	-.14668	7.74040	34.980	-1.68130	1.289	.846	.953	.646	.4951	188.225	1.000
8.006	.001	-.18265	7.80046	30.610	-1.06220	1.245	.817	.944	.547	.5454	191.157	1.000
8.008	.001	-.21540	7.85772	27.404	-.71143	1.214	.796	.937	.477	.5800	193.974	1.000
8.012	.001	-.26612	7.97225	23.190	-.37591	1.174	.770	.928	.389	.6223	199.670	1.000
8.016	.002	-.31196	8.08267	20.431	-.26322	1.149	.754	.922	.333	.6482	205.239	1.000
8.023	.003	-.37907	8.30151	16.866	-.13856	1.118	.734	.915	.264	.6803	216.503	1.000
8.027	.003	-.41101	8.40733	15.673	-.09423	1.109	.727	.913	.243	.6898	222.058	1.000
8.031	.004	-.43884	8.51215	14.646	-.10834	1.101	.722	.911	.225	.6983	227.630	1.000
8.039	.005	-.49022	8.71749	13.113	-.05074	1.088	.714	.908	.197	.7108	238.744	1.000
8.047	.006	-.53434	8.91806	11.933	-.05657	1.080	.708	.906	.178	.7196	249.857	1.000
8.063	.008	-.61005	9.30572	10.204	-.03258	1.066	.699	.903	.147	.7335	272.050	1.000
8.125	.016	-.81262	10.71348	6.748	-.01166	1.041	.683	.897	.093	.7582	360.588	1.000
8.250	.031	-1.03547	13.07151	4.276	-.00554	1.025	.672	.893	.056	.7749	536.786	1.000
8.500	.062	-1.24794	16.81102	2.570	-.00206	1.013	.665	.890	.030	.7867	887.847	1.000
9.000	.125	-1.44790	22.48107	1.468	-.00083	1.006	.660	.888	.014	.7935	1587.756	1.000
10.000	.250	-1.59216	30.82538	.819	-.00029	1.003	.658	.887	.006	.7972	2985.154	1.000
11.000	.375	-1.67921	37.34435	.582	-.00014	1.002	.657	.887	.004	.7983	4381.267	1.000
12.000	.500	-1.72560	42.88201	.458	-.00009	1.001	.657	.887	.003	.7989	5776.970	1.000
14.000	.750	-1.79233	52.22272	.327	-.00004	1.001	.656	.887	.001	.7994	8567.791	1.000
16.000	1.000	-1.83106	60.12845	.260	-.00003	1.000	.656	.887	.001	.7997	11358.209	1.000

SUM-VM*COS(PHI)*DFLOW = 9942.57
SUM-(P-PSO)*COS(PHI)*DA = 49.90
TOT AXIAL MOMENTUM FLUX = 9992.47

SUM-VM*SIN(PHI)*DFLOW = 161.78
SUM-(P-PSO)*SIN(PHI)*DA = 7.87
TOTAL Y-MOMENTUM FLUX = 169.66

STATION COORDINATE, XI1= 16.023 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.01037	7.62602	110.429	5.62653	1.505	.988	.996	1.128	.1338	182.703	1.000
8.000	.062	-.01542	7.62598	71.245	-19.08177	1.492	.979	.994	1.099	.1741	182.701	1.000
8.000	.125	-.03337	7.63447	61.885	-11.53775	1.465	.961	.989	1.037	.2393	183.108	1.000
8.001	.250	-.05871	7.65038	52.825	-7.13961	1.422	.933	.980	.943	.3161	183.872	1.000
8.002	.500	-.09358	7.68234	44.167	-3.80350	1.358	.891	.968	.799	.4098	185.412	1.000
8.004	1.000	-.14418	7.74215	35.271	-1.65190	1.287	.844	.953	.641	.4976	188.310	1.000

STATION COORDINATE, XI1= 16.047 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.00299	7.65202	101.145	6.22945	1.439	.944	.984	.980	.2880	183.951	1.000
8.000	.016	-.01150	7.65098	86.479	-1.17634	1.445	.948	.985	.992	.2781	183.901	1.000
8.000	.031	-.02556	7.65361	72.762	-6.60014	1.435	.941	.983	.970	.2956	184.027	1.000
8.001	.062	-.04910	7.66469	59.182	-5.67328	1.401	.919	.976	.896	.3487	184.561	1.000
8.002	.125	-.08467	7.69141	46.737	-3.24283	1.345	.883	.965	.771	.4262	185.850	1.000
8.004	.250	-.13369	7.74973	36.450	-1.52571	1.276	.837	.951	.617	.5100	188.679	1.000
8.006	.375	-.17252	7.80654	31.287	-.93944	1.236	.811	.942	.527	.5556	191.455	1.000
8.008	.500	-.20443	7.86347	27.893	-.66411	1.207	.792	.936	.462	.5871	194.258	1.000
8.012	.750	-.25804	7.97573	23.379	-.37129	1.169	.767	.927	.377	.6278	199.844	1.000
8.016	1.000	-.30241	8.08625	20.580	-.24543	1.145	.751	.922	.325	.6522	205.420	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.070 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.00004	7.67887	91.182	6.30030	1.270	.833	.949	.602	.5177	185.244	1.000
8.000	.031	-.00905	7.67963	81.397	7.24445	1.299	.852	.955	.668	.4834	185.281	1.000
8.000	.062	-.01837	7.68154	75.706	3.05366	1.319	.865	.959	.712	.4596	185.373	1.000
8.001	.125	-.03668	7.68831	64.083	-.69528	1.326	.870	.961	.728	.4504	185.700	1.000
8.002	.250	-.06866	7.70961	50.285	-1.86015	1.305	.856	.957	.681	.4761	186.730	1.000
8.004	.500	-.11803	7.76164	37.974	-1.17733	1.254	.823	.946	.568	.5353	189.259	1.000
8.006	.750	-.15625	7.81662	32.240	-.79868	1.220	.800	.938	.490	.5735	191.950	1.000
8.008	1.000	-.16867	7.87193	28.519	-.55869	1.195	.784	.933	.435	.6004	194.676	1.000

STATION COORDINATE, XI1= 16.094 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.00479	7.70536	67.588	14.43993	.964	.633	.877	-.079	.8358	186.524	1.000
8.000	.000	-.00178	7.70780	69.974	6.27010	1.024	.672	.893	.054	.7756	186.642	1.000
8.000	.001	-.00843	7.71059	64.544	9.36151	1.072	.703	.904	.160	.7275	186.778	1.000
8.001	.002	-.02166	7.71760	59.728	5.27466	1.153	.756	.923	.341	.6445	187.118	1.000
8.001	.003	-.03475	7.72618	54.306	1.63926	1.186	.778	.931	.415	.6098	187.634	1.000
8.002	.004	-.04748	7.73584	50.873	1.25667	1.200	.787	.934	.446	.5950	188.003	1.000
8.003	.006	-.07114	7.75791	44.599	.15501	1.213	.796	.937	.475	.5810	189.077	1.000
8.004	.008	-.09307	7.78176	39.615	-.60895	1.208	.792	.936	.463	.5865	190.242	1.000
8.006	.012	-.12979	7.83371	33.380	-.46344	1.186	.778	.931	.416	.6092	192.790	1.000
8.008	.016	-.16268	7.88630	29.321	-.38326	1.170	.768	.927	.379	.6266	195.387	1.000
8.012	.023	-.21437	7.99502	24.239	-.25804	1.145	.751	.921	.323	.6531	200.812	1.000
8.016	.031	-.26084	8.10208	21.107	-.16779	1.128	.740	.917	.285	.6707	206.226	1.000
8.023	.047	-.32890	8.31691	17.250	-.11706	1.105	.725	.912	.234	.6942	217.307	1.000
8.027	.055	-.36108	8.42145	15.868	-.05006	1.098	.720	.910	.218	.7013	222.804	1.000
8.031	.062	-.38920	8.52526	14.927	-.08253	1.092	.716	.909	.206	.7070	228.331	1.000
8.039	.078	-.44095	8.72903	13.253	-.04534	1.082	.710	.907	.183	.7174	239.377	1.000
8.047	.094	-.48540	8.92847	12.073	-.04104	1.075	.705	.905	.167	.7243	250.440	1.000
8.063	.125	-.56154	9.31449	10.296	-.03254	1.063	.698	.902	.142	.7360	272.564	1.000
8.125	.250	-.76650	10.71895	6.777	-.00982	1.040	.682	.897	.090	.7595	360.956	1.000
8.250	.500	-.98581	13.07523	4.292	-.00584	1.025	.672	.893	.056	.7748	537.092	1.000
8.500	1.000	-1.20869	16.81279	2.575	-.00201	1.013	.665	.890	.029	.7869	888.033	1.000

STREAMTUBE CURVATURE PROGRAM

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.141 CHANNELS- EXT SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.03834	7.74715	39.709	5.23833	.872	.572	.852	-.287	.9305	188.553	1.000
8.000	.001	.02944	7.75773	41.361	4.67471	.948	.622	.873	-.117	.8528	189.069	1.000
8.001	.002	.02003	7.76781	43.781	-1.64116	.967	.634	.878	-.075	.8337	189.560	1.000
8.001	.003	.01052	7.77778	43.641	-.28661	.950	.623	.874	-.112	.8506	190.047	1.000
8.002	.004	.00096	7.78772	42.971	.89242	.955	.626	.875	-.101	.8458	190.533	1.000
8.003	.006	-.01743	7.80822	40.637	.83159	.976	.641	.881	-.053	.8237	191.538	1.000
8.004	.008	-.03502	7.82950	37.738	1.53112	1.007	.661	.888	.016	.7927	192.583	1.000
8.006	.012	-.06705	7.87546	33.081	.69239	1.060	.695	.901	.134	.7394	194.850	1.000
8.008	.016	-.09688	7.92386	29.654	.25734	1.081	.709	.906	.180	.7185	197.253	1.000
8.012	.023	-.14762	8.02560	24.790	.01770	1.091	.716	.909	.203	.7082	202.351	1.000
8.016	.031	-.19256	8.12881	21.550	-.03397	1.090	.715	.909	.200	.7093	207.589	1.000
8.023	.047	-.26294	8.33761	17.544	-.03303	1.084	.711	.907	.188	.7152	218.390	1.000
8.031	.062	-.32518	8.54247	15.145	-.04820	1.077	.707	.906	.172	.7222	229.254	1.000
8.039	.078	-.37462	8.74470	13.402	-.01983	1.071	.703	.904	.159	.7280	240.237	1.000
8.047	.094	-.42038	8.94246	12.201	-.03106	1.067	.700	.903	.150	.7322	251.226	1.000
8.063	.125	-.49583	9.32650	10.412	-.02681	1.058	.694	.901	.130	.7414	273.267	1.000
8.125	.250	-.70537	10.72624	6.809	-.00868	1.038	.681	.896	.086	.7612	361.447	1.000
8.250	.500	-.92228	13.08001	4.313	-.00555	1.025	.672	.893	.055	.7753	537.485	1.000
8.500	1.000	-1.15306	16.81529	2.581	-.00194	1.013	.664	.890	.029	.7871	888.298	1.000

STATION COORDINATE, XI1= 16.152 CHANNELS- EXT SUB

XI2	STRM FNCT	X.Z	Y.R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.04903	7.75543	35.931	4.46753	.568	.372	.754	-.965	1.2770	188.957	1.000
8.000	.001	.04007	7.76699	39.889	2.69528	.633	.415	.778	-.820	1.1951	189.520	1.000
8.001	.002	.03086	7.77758	40.886	2.23690	.675	.443	.792	-.727	1.1452	190.037	1.000
8.001	.003	.02188	7.78796	40.599	2.49330	.714	.468	.805	-.639	1.1002	190.545	1.000
8.002	.004	.01305	7.79827	39.676	2.71704	.756	.496	.819	-.544	1.0528	191.050	1.000
8.003	.006	-.00381	7.81935	38.125	2.02514	.826	.542	.839	-.389	.9784	192.084	1.000
8.004	.008	-.01958	7.84096	35.097	3.25756	.903	.593	.861	-.216	.8979	193.147	1.000
8.006	.012	-.04922	7.88685	32.048	1.01115	1.011	.663	.889	.024	.7893	195.415	1.000
8.008	.016	-.07761	7.93474	29.225	.41974	1.043	.684	.897	.096	.7567	197.795	1.000
8.012	.023	-.12736	8.03494	24.689	.14142	1.066	.700	.903	.148	.7331	202.822	1.000
8.016	.031	-.17130	8.13721	21.547	.03861	1.074	.704	.905	.165	.7256	208.018	1.000
8.023	.047	-.24273	8.34400	17.574	-.01528	1.075	.705	.905	.167	.7244	218.725	1.000
8.031	.062	-.30335	8.54839	15.194	-.02779	1.071	.703	.904	.159	.7283	229.572	1.000
8.047	.094	-.39838	8.94722	12.236	-.02223	1.063	.697	.902	.140	.7366	251.493	1.000
8.063	.125	-.47543	9.33025	10.442	-.02339	1.056	.692	.900	.124	.7440	273.487	1.000
8.125	.250	-.68004	10.72926	6.822	-.00902	1.037	.681	.896	.083	.7623	361.651	1.000
8.250	.500	-.90219	13.08153	4.320	-.00525	1.023	.671	.892	.052	.7764	537.609	1.000
8.500	1.000	-1.12236	16.81668	2.584	-.00190	1.013	.664	.890	.028	.7873	888.444	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.164 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.06021	7.76306	32.786	3.63766	.831	.545	.841	-.378	.9730	189.328	1.000
8.000	.001	.05295	7.77498	29.565	-1.57135	.838	.550	.843	-.362	.9658	189.910	1.000
8.001	.002	.04626	7.78714	28.551	.18387	.823	.540	.839	-.395	.9810	190.505	1.000
8.001	.003	.03965	7.79911	28.559	.88725	.832	.546	.841	-.375	.9716	191.091	1.000
8.002	.004	.03315	7.81099	28.754	1.27436	.849	.557	.846	-.338	.9542	191.673	1.000
8.003	.006	.02009	7.83449	29.436	.53017	.872	.572	.852	-.286	.9302	192.829	1.000
8.004	.008	.00668	7.85767	30.502	1.41559	.900	.591	.860	-.223	.9012	193.971	1.000
8.006	.012	-.02036	7.90423	30.065	.97884	.965	.633	.878	-.078	.8352	196.277	1.000
8.008	.016	-.04693	7.95158	28.243	.54302	1.002	.657	.887	.005	.7978	198.635	1.000
8.012	.023	-.09453	8.04990	24.248	.27636	1.039	.682	.896	.088	.7603	203.578	1.000
8.016	.031	-.13713	8.15065	21.379	.11552	1.057	.693	.901	.126	.7429	208.706	1.000
8.023	.047	-.20770	8.35511	17.584	.00388	1.065	.699	.903	.146	.7342	219.308	1.000
8.031	.062	-.26788	8.55804	15.233	-.01668	1.064	.698	.902	.144	.7350	230.090	1.000
8.047	.094	-.36281	8.95495	12.277	-.01931	1.059	.695	.901	.132	.7403	251.928	1.000
8.063	.125	-.43987	9.33682	10.486	-.01914	1.053	.691	.900	.118	.7465	273.872	1.000
8.125	.250	-.64464	10.73350	6.841	-.00969	1.037	.680	.896	.082	.7632	361.937	1.000
8.250	.500	-.86741	13.08415	4.330	-.00499	1.022	.671	.892	.050	.7776	537.825	1.000
8.500	1.000	-1.08730	16.81826	2.588	-.00186	1.012	.664	.890	.028	.7874	888.612	1.000

STATION COORDINATE, XI1= 16.176 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.07175	7.77013	30.283	2.80153	.929	.609	.868	-.159	.8721	189.673	1.000
8.000	.001	.06494	7.78169	29.649	1.31170	.957	.628	.875	-.096	.8434	190.248	1.000
8.001	.002	.05822	7.79374	29.192	-1.20564	.956	.627	.875	-.097	.8439	190.828	1.000
8.001	.003	.05165	7.80567	28.680	-.56631	.944	.619	.872	-.125	.8565	191.412	1.000
8.002	.004	.04511	7.81755	28.978	-1.50140	.929	.610	.868	-.157	.8713	191.995	1.000
8.003	.006	.03193	7.84117	29.449	-.36569	.903	.593	.861	-.216	.8979	193.157	1.000
8.004	.008	.01859	7.86456	29.706	.58514	.908	.595	.862	-.206	.8935	194.312	1.000
8.006	.012	-.00781	7.91138	29.375	.63714	.942	.618	.871	-.130	.8588	196.632	1.000
8.008	.016	-.03376	7.95858	27.732	.66208	.975	.640	.880	-.055	.8247	198.985	1.000
8.012	.023	-.08022	8.05630	23.973	.33604	1.023	.671	.892	.052	.7766	203.902	1.000
8.016	.031	-.12224	8.15646	21.254	.16035	1.046	.686	.898	.102	.7541	209.003	1.000
8.023	.047	-.19219	8.36002	17.573	.02023	1.059	.695	.901	.133	.7401	219.566	1.000
8.031	.062	-.25223	8.56230	15.239	-.00251	1.061	.696	.902	.135	.7389	230.319	1.000
8.047	.094	-.34692	8.95841	12.294	-.01700	1.057	.693	.901	.127	.7426	252.123	1.000
8.063	.125	-.42404	9.33975	10.502	-.01695	1.051	.690	.899	.115	.7481	274.044	1.000
8.125	.250	-.62871	10.73542	6.650	-.00975	1.036	.680	.896	.080	.7637	362.066	1.000
8.250	.500	-.85186	13.08533	4.334	-.00485	1.022	.670	.892	.049	.7781	537.922	1.000
8.500	1.000	-1.07142	16.81898	2.590	-.00184	1.012	.664	.890	.028	.7875	888.687	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.187 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.08355	7.77674	28.258	2.41473	.922	.605	.866	-.173	.8784	189.996	1.000
8.000	.001	.07702	7.78870	29.069	.61858	.941	.617	.871	-.131	.8593	190.581	1.000
8.001	.002	.07033	7.80058	29.590	.22618	.947	.621	.873	-.119	.8538	191.163	1.000
8.002	.004	.05679	7.82415	29.860	-.74231	.935	.614	.870	-.145	.8654	192.320	1.000
8.003	.006	.04347	7.84769	29.328	.73335	.936	.614	.870	-.144	.8651	193.479	1.000
8.004	.008	.03015	7.87113	29.742	-.69956	.934	.613	.869	-.147	.8665	194.636	1.000
8.006	.012	.00385	7.91789	29.012	.31212	.923	.606	.867	-.171	.8774	196.956	1.000
8.008	.016	-.02147	7.96497	27.192	.69240	.951	.624	.874	-.109	.8492	199.305	1.000
8.012	.023	-.06679	8.06223	23.655	.42250	1.007	.661	.888	.017	.7925	204.202	1.000
8.016	.031	-.10815	8.16192	21.098	.19754	1.036	.679	.895	.080	.7640	209.283	1.000
8.023	.047	-.17741	8.36470	17.549	.03435	1.054	.691	.900	.120	.7456	219.811	1.000
8.031	.062	-.23730	8.56637	15.237	.00568	1.057	.693	.901	.127	.7425	230.538	1.000
8.047	.094	-.33171	8.96173	12.308	-.01480	1.055	.692	.900	.122	.7448	252.309	1.000
8.063	.125	-.40891	9.34256	10.516	-.01505	1.050	.689	.899	.112	.7496	274.209	1.000
8.125	.250	-.61340	10.73726	6.859	-.00975	1.036	.679	.895	.079	.7642	362.190	1.000
8.250	.500	-.83704	13.08646	4.338	-.00474	1.021	.670	.892	.048	.7785	538.015	1.000
8.500	1.000	-1.05607	16.81967	2.592	-.00182	1.012	.664	.890	.028	.7876	888.761	1.000

STATION COORDINATE, XI1= 16.211 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.10775	7.78885	25.128	1.61874	.523	.343	.737	-1.064	1.3365	190.588	1.000
8.001	.002	.09552	7.81401	27.066	1.19161	.575	.377	.757	-.950	1.2678	191.822	1.000
8.002	.004	.08275	7.83830	27.951	.74204	.608	.399	.769	-.874	1.2249	193.016	1.000
8.003	.006	.07000	7.86225	28.280	.56315	.630	.413	.777	-.826	1.1984	194.198	1.000
8.004	.008	.05730	7.88595	27.882	.82381	.653	.429	.785	-.774	1.1701	195.370	1.000
8.006	.012	.03301	7.93319	26.551	1.16053	.715	.469	.806	-.635	1.0984	197.718	1.000
8.008	.016	.01047	7.98056	24.353	2.14602	.821	.539	.838	-.400	.9834	200.086	1.000
8.012	.023	-.03086	8.07756	22.473	.63308	.967	.634	.878	-.073	.8331	204.979	1.000
8.016	.031	-.07021	8.17636	20.546	.27677	1.009	.662	.889	.020	.7908	210.024	1.000
8.023	.047	-.13782	8.37717	17.416	.07783	1.038	.681	.896	.085	.7615	220.468	1.000
8.031	.062	-.19684	8.57738	15.200	.02542	1.047	.687	.898	.104	.7529	231.131	1.000
8.047	.094	-.29107	8.97061	12.333	-.00572	1.049	.688	.899	.109	.7506	252.810	1.000
8.063	.125	-.36804	9.35016	10.547	-.01091	1.046	.686	.898	.103	.7534	274.655	1.000
8.125	.250	-.57343	10.74207	6.881	-.00912	1.034	.679	.895	.077	.7654	362.515	1.000
8.250	.500	-.79683	13.08951	4.349	-.00451	1.021	.670	.892	.047	.7790	538.266	1.000
8.500	1.000	-1.01777	16.82141	2.596	-.00177	1.012	.664	.890	.027	.7878	888.944	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.234 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.13245	7.79989	23.126	1.13630	.957	.628	.875	-.096	.8433	191.129	1.000
8.001	.002	.12216	7.82503	21.379	-.63799	.960	.630	.876	-.089	.8402	192.363	1.000
8.002	.004	.11257	7.85030	20.596	-.87478	.940	.616	.871	-.135	.8609	193.608	1.000
8.004	.008	.09375	7.90045	20.116	-.61129	.899	.590	.860	-.226	.9027	196.089	1.000
8.006	.012	.07571	7.95029	20.320	-.18310	.876	.575	.854	-.277	.9259	198.571	1.000
8.008	.016	.05707	7.99949	20.749	.36131	.882	.579	.855	-.263	.9195	201.036	1.000
8.012	.023	.02007	8.09765	20.654	.51864	.933	.612	.869	-.149	.8676	206.000	1.000
8.016	.031	-.01636	8.19602	19.550	.32790	.975	.640	.880	-.055	.8248	211.036	1.000
8.023	.047	-.04139	8.39470	17.065	.12921	1.016	.667	.891	.036	.7836	221.391	1.000
8.031	.062	-.13880	8.59308	15.065	.05262	1.032	.677	.895	.071	.7679	231.978	1.000
8.047	.094	-.23245	8.98342	12.331	.00663	1.041	.683	.897	.090	.7592	253.533	1.000
8.063	.125	-.30896	9.36117	10.574	-.00484	1.041	.683	.897	.091	.7590	275.303	1.000
8.125	.250	-.51536	10.74910	6.910	-.00820	1.032	.677	.895	.073	.7673	362.989	1.000
8.250	.500	-.73850	13.09395	4.363	-.00417	1.020	.669	.892	.045	.7797	538.631	1.000
8.500	1.000	-.96182	16.62395	2.601	-.00170	1.012	.664	.890	.027	.7880	889.213	1.000

STATION COORDINATE, XI1= 16.258 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.15748	7.81018	21.682	.80286	.850	.558	.846	-.334	.9526	191.634	1.000
8.001	.002	.14765	7.83509	21.394	.61896	.871	.571	.852	-.288	.9311	192.858	1.000
8.002	.004	.13797	7.86004	21.067	.27012	.883	.579	.856	-.261	.9185	194.088	1.000
8.004	.008	.11894	7.90984	20.609	-.03441	.888	.583	.857	-.250	.9136	196.556	1.000
8.006	.012	.10047	7.95950	20.435	.02637	.887	.582	.857	-.253	.9149	199.031	1.000
8.008	.016	.08204	8.00884	20.340	.17856	.892	.585	.858	-.240	.9091	201.506	1.000
8.012	.023	.04604	8.10725	19.935	.39136	.925	.607	.867	-.168	.8759	206.489	1.000
8.016	.031	.01100	8.20560	19.005	.32873	.962	.631	.877	-.085	.8385	211.529	1.000
8.023	.047	-.05259	8.40348	16.822	.15138	1.006	.660	.888	.014	.7935	221.854	1.000
8.031	.062	-.10898	8.60106	14.962	.06383	1.025	.672	.893	.056	.7747	232.410	1.000
8.047	.094	-.20230	8.99001	12.315	.01225	1.037	.680	.896	.082	.7632	253.904	1.000
8.063	.125	-.27643	9.36687	10.580	-.00195	1.038	.681	.896	.085	.7617	275.638	1.000
8.125	.250	-.48553	10.75271	6.923	-.00776	1.032	.677	.894	.071	.7681	363.234	1.000
8.250	.500	-.70827	13.09626	4.371	-.00402	1.020	.669	.892	.044	.7800	538.821	1.000
8.500	1.000	-.93339	16.82524	2.604	-.00167	1.012	.664	.889	.026	.7882	889.349	1.000

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.281 CHANNELS- EXT SUB.

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.18273	7.81991	20.483	.70283	.866	.568	.851	-.300	.9366	192.112	1.000
8.001	.002	.17331	7.84495	20.735	.21362	.878	.576	.854	-.273	.9241	193.344	1.000
8.002	.004	.16384	7.86992	20.778	.09321	.882	.579	.855	-.263	.9198	194.577	1.000
8.004	.008	.14497	7.91965	20.676	-.07176	.882	.578	.855	-.264	.9203	197.043	1.000
8.006	.012	.12642	7.96916	20.383	.00333	.879	.577	.854	-.270	.9230	199.515	1.000
8.008	.016	.10817	8.01846	20.096	.15054	.883	.579	.856	-.261	.9185	201.991	1.000
8.012	.023	.07294	8.11684	19.329	.35821	.912	.599	.864	-.196	.8886	206.978	1.000
8.016	.031	.03917	8.21514	18.436	.33842	.949	.622	.873	-.115	.8518	212.022	1.000
8.023	.047	-.02292	8.41237	16.541	.16515	.996	.654	.886	-.008	.8036	222.324	1.000
8.031	.062	-.07825	8.60926	14.634	.07661	1.018	.668	.891	.039	.7822	232.853	1.000
8.047	.094	-.17109	8.99682	12.287	.01780	1.032	.677	.895	.072	.7676	254.289	1.000
8.063	.125	-.24682	9.37278	10.581	.00119	1.035	.679	.895	.078	.7646	275.986	1.000
8.125	.250	-.45447	10.75649	6.937	-.00724	1.031	.676	.894	.069	.7691	363.489	1.000
8.250	.500	-.67686	13.09867	4.378	-.00385	1.020	.669	.691	.044	.7803	539.019	1.000
8.500	1.000	-.90363	16.82659	2.607	-.00163	1.012	.664	.689	.026	.7883	889.492	1.000

STATION COORDINATE, XI1= 16.328 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.23376	7.83796	18.558	.53785	.650	.427	.784	-.780	1.1737	192.999	1.000
8.002	.004	.21655	7.88883	18.944	.48264	.685	.449	.796	-.704	1.1333	195.513	1.000
8.004	.008	.19920	7.93904	18.931	.36765	.712	.467	.805	-.642	1.1018	198.010	1.000
8.006	.012	.18205	7.98885	18.725	.33889	.732	.480	.811	-.597	1.0793	200.502	1.000
8.008	.016	.16556	8.03847	17.735	1.13237	.780	.512	.826	-.490	1.0267	203.000	1.000
8.012	.023	.13408	8.13732	17.552	.58307	.879	.577	.854	-.270	.9228	208.023	1.000
8.016	.031	.10322	8.23568	17.109	.34785	.927	.608	.868	-.163	.8738	213.083	1.000
8.023	.047	.04497	8.43209	15.843	.17918	.977	.641	.881	-.052	.8235	223.368	1.000
8.031	.062	-.00806	8.62762	14.467	.09969	1.002	.657	.887	.004	.7961	233.847	1.000
8.047	.094	-.09889	9.01248	12.189	.02844	1.022	.671	.892	.050	.7775	255.175	1.000
8.063	.125	-.17381	9.38640	10.559	.00892	1.028	.675	.894	.063	.7715	276.789	1.000
8.125	.250	-.38128	10.76541	6.966	-.00648	1.028	.675	.894	.063	.7714	364.092	1.000
8.250	.500	-.60404	13.10425	4.393	-.00340	1.018	.668	.891	.041	.7815	539.479	1.000
8.500	1.000	-.83174	16.82987	2.613	-.00154	1.011	.663	.889	.025	.7887	889.839	1.000

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STATION COORDINATE, XI1= 16.352 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.25947	7.84639	17.788	.45474	1.027	.674	.893	.061	.7723	193.415	1.000
8.002	.004	.24343	7.89712	17.211	-1.10507	1.008	.661	.888	.017	.7923	195.924	1.000
8.004	.008	.22785	7.94769	16.876	-1.43091	.941	.617	.871	-.132	.8599	198.441	1.000
8.006	.012	.21244	7.99808	16.708	-.78040	.879	.577	.855	-.269	.9225	200.965	1.000
8.008	.016	.19720	8.04816	16.689	-.02904	.858	.563	.849	-.316	.9442	203.490	1.000
8.012	.023	.16774	8.14763	16.580	.38032	.883	.579	.856	-.261	.9186	208.551	1.000
8.016	.031	.13851	8.24630	16.410	.31418	.920	.604	.866	-.178	.8808	213.633	1.000
8.023	.047	.08255	8.44261	15.439	.18201	.968	.635	.878	-.071	.8319	223.925	1.000
8.031	.062	.03095	8.63760	14.230	.10597	.995	.652	.885	-.012	.8054	234.388	1.000
8.047	.094	-.05846	9.02119	12.115	.03424	1.017	.667	.891	.039	.7824	255.669	1.000
8.063	.125	-.13283	9.39404	10.534	.01257	1.025	.672	.893	.056	.7749	277.239	1.000
8.125	.250	-.33987	10.77048	6.981	-.00606	1.027	.674	.893	.061	.7725	364.435	1.000
8.250	.500	-.56303	13.10740	4.401	-.00319	1.018	.668	.891	.040	.7821	539.738	1.000
8.500	1.000	-.79082	16.83174	2.617	-.00149	1.011	.663	.889	.025	.7889	890.036	1.000

STATION COORDINATE, XI1= 16.363 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.27237	7.85049	17.446	.45774	.853	.559	.847	-.329	.9501	193.617	1.000
8.002	.004	.25639	7.90118	17.483	-.24346	.857	.562	.848	-.320	.9461	196.125	1.000
8.004	.008	.24055	7.95163	17.463	-.46702	.834	.547	.842	-.371	.9699	198.638	1.000
8.006	.012	.22488	8.00188	17.051	-.13111	.814	.534	.836	-.416	.9912	201.156	1.000
8.008	.016	.20988	8.05195	16.524	.75274	.835	.547	.842	-.369	.9691	203.682	1.000
8.012	.023	.18075	8.15147	16.327	.26377	.890	.584	.858	-.245	.9114	208.748	1.000
8.016	.031	.15195	8.25023	16.169	.28215	.919	.603	.865	-.182	.8822	213.836	1.000
8.023	.047	.09668	8.44649	15.287	.18196	.965	.633	.877	-.079	.8356	224.131	1.000
8.031	.062	.04554	8.64128	14.138	.10787	.991	.650	.884	-.019	.8088	234.588	1.000
8.047	.094	-.04334	9.02443	12.084	.03694	1.015	.666	.890	.034	.7848	255.852	1.000
8.063	.125	-.11752	9.39688	10.522	.01416	1.023	.671	.892	.052	.7765	277.407	1.000
8.125	.250	-.32434	10.77238	6.986	-.00575	1.027	.674	.893	.060	.7731	364.564	1.000
8.250	.500	-.54765	13.10859	4.403	-.00308	1.018	.668	.891	.039	.7823	539.836	1.000
8.500	1.000	-.77537	16.83244	2.618	-.00147	1.011	.663	.889	.025	.7889	890.111	1.000

STREAMTUBE CURVATURE PROGRAM

IDENT= NASA INLET CONFIGURATION NO. 8

STATION COORDINATE, XI1= 16.375 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.28529	7.85451	17.103	.42480	.846	.555	.845	-.343	.9568	193.815	1.000
8.002	.004	.26986	7.90526	16.605	.08651	.859	.564	.849	-.314	.9431	196.328	1.000
8.004	.008	.25497	7.95595	16.293	.04082	.862	.566	.850	-.307	.9401	198.854	1.000
8.006	.012	.24029	8.00640	16.031	-.00698	.863	.566	.850	-.306	.9396	201.384	1.000
8.008	.016	.22594	8.05662	16.006	.16166	.867	.569	.851	-.296	.9349	203.918	1.000
8.012	.023	.19726	8.15627	16.085	.24201	.890	.584	.858	-.245	.9113	208.993	1.000
8.016	.031	.16896	8.25512	15.897	.25644	.917	.601	.865	-.186	.8843	214.090	1.000
8.023	.047	.11456	8.45135	15.094	.18022	.960	.630	.876	-.089	.8400	224.389	1.000
8.031	.062	.06405	8.64592	14.018	.11042	.987	.648	.883	-.029	.8129	234.840	1.000
8.047	.094	-.02415	9.02853	12.040	.04014	1.012	.664	.890	.027	.7878	256.085	1.000
8.063	.125	-.09804	9.40050	10.505	.01626	1.021	.670	.892	.047	.7786	277.620	1.000
8.125	.250	-.30462	10.77480	6.992	-.00544	1.026	.673	.893	.058	.7739	364.727	1.000
8.250	.500	-.52807	13.11010	4.407	-.00293	1.017	.667	.891	.038	.7827	539.960	1.000
8.500	1.000	-.75585	16.83334	2.620	-.00145	1.011	.663	.889	.024	.7890	890.206	1.000

STATION COORDINATE, XI1= 16.422 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.33718	7.86989	15.991	.29260	.814	.534	.836	-.415	.9905	194.575	1.000
8.002	.250	.32263	7.92073	15.957	.32425	.833	.546	.841	-.373	.9707	197.097	1.000
8.004	.500	.30819	7.97133	15.856	.21663	.849	.557	.846	-.338	.9543	199.624	1.000
8.006	.750	.29397	8.02172	15.706	.20928	.861	.565	.849	-.311	.9420	202.155	1.000
8.008	1.000	.27991	8.07191	15.596	.15489	.871	.571	.852	-.288	.9313	204.693	1.000

STATION COORDINATE, XI1= 16.469 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.38931	7.88443	15.206	.22860	.837	.549	.843	-.363	.9661	195.295	1.000
8.002	.004	.37541	7.93543	15.273	.11049	.846	.555	.845	-.344	.9571	197.829	1.000
8.004	.008	.36160	7.98615	15.145	.23038	.856	.561	.848	-.322	.9470	200.366	1.000
8.006	.012	.34796	8.03662	15.193	.10926	.865	.568	.851	-.301	.9371	202.907	1.000
8.008	.016	.33436	8.08682	15.002	.21249	.874	.574	.853	-.281	.9277	205.450	1.000
8.012	.023	.30807	8.18671	14.707	.17821	.896	.588	.859	-.233	.9058	210.556	1.000
8.016	.031	.28213	8.28576	14.522	.15408	.913	.599	.864	-.195	.8882	215.683	1.000
8.023	.047	.23255	8.48187	13.951	.14663	.943	.619	.872	-.127	.8573	226.013	1.000
8.031	.062	.18562	8.67538	13.225	.11066	.968	.635	.878	-.072	.8326	236.443	1.000
8.047	.094	.10198	9.05505	11.692	.05394	.996	.654	.886	-.008	.8037	257.592	1.000
8.063	.125	.03021	9.42411	10.345	-.02646	1.010	.662	.889	.021	.7904	279.017	1.000
8.125	.250	-.17430	10.79082	7.024	-.00283	1.022	.670	.892	.048	.7783	365.813	1.000
8.250	.500	-.39826	13.12012	4.426	-.00219	1.016	.666	.891	.036	.7840	540.786	1.000
8.500	1.000	-.62642	16.83927	2.630	-.00128	1.010	.663	.889	.023	.7896	890.833	1.000

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STATION COORDINATE, XI1= 16.563 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.49405	7.91175	14.139	.14149	.851	.559	.847	-.332	.9515	196.651	1.000
8.004	.008	.46852	8.01380	13.942	.14969	.868	.569	.851	-.295	.9343	201.756	1.000
8.008	.016	.44359	8.11485	13.857	.14175	.884	.580	.856	-.258	.9175	206.876	1.000
8.012	.023	.41883	8.21482	13.891	.07101	.895	.587	.859	-.234	.9062	212.005	1.000
8.016	.031	.39466	8.31386	13.531	.14457	.907	.595	.862	-.208	.8944	217.148	1.000
8.023	.047	.34850	8.50966	13.042	.11962	.934	.613	.869	-.148	.8669	227.496	1.000
8.031	.062	.30473	8.70256	12.489	.09942	.955	.626	.875	-.101	.8456	237.927	1.000
8.047	.094	.22527	9.08012	11.280	.06051	.983	.645	.882	-.037	.8168	259.020	1.000
8.063	.125	.15606	9.44684	10.124	.03369	.999	.655	.886	-.002	.8009	280.364	1.000
8.125	.250	-.04607	10.80664	7.034	.00008	1.017	.667	.891	.038	.7827	366.886	1.000
8.250	.500	-.26968	13.13009	4.439	-.00149	1.015	.666	.890	.033	.7850	541.608	1.000
8.500	1.000	-.49901	16.84513	2.639	-.00112	1.010	.662	.889	.022	.7903	891.454	1.000

STATION COORDINATE, XI1= 16.750 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	.70469	7.96173	12.608	.11132	.866	.568	.851	-.299	.9361	199.143	1.000
8.004	.008	.68179	8.06382	12.653	.05575	.874	.574	.853	-.280	.9276	204.283	1.000
8.008	.016	.65941	8.16480	12.285	.10581	.883	.580	.856	-.260	.9183	209.431	1.000
8.016	.031	.61691	8.36393	11.964	.09537	.905	.594	.862	-.213	.8964	219.771	1.000
8.023	.047	.57587	8.55928	11.647	.08961	.923	.606	.867	-.171	.8775	230.157	1.000
8.031	.062	.53762	8.75133	11.273	.07942	.940	.616	.871	-.135	.8609	240.601	1.000
8.047	.094	.46486	9.12608	10.445	.05891	.965	.633	.878	-.078	.8353	261.649	1.000
8.063	.125	.40081	9.48941	9.593	.04097	.982	.644	.882	-.040	.8181	282.897	1.000
8.125	.250	.20524	10.83758	6.993	.00557	1.008	.661	.889	.016	.7917	368.990	1.000
8.250	.500	-.01667	13.14977	4.451	-.00006	1.013	.664	.890	.028	.7873	543.233	1.000
8.500	1.000	-.24708	16.85678	2.653	-.00081	1.008	.662	.889	.019	.7915	892.686	1.000

STATION COORDINATE, XI1= 17.125 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	1.12915	8.04711	10.371	.06332	.880	.577	.855	-.268	.9220	203.437	1.000
8.008	.031	1.09235	8.25004	10.182	.06048	.893	.586	.858	-.239	.9084	213.827	1.000
8.016	.062	1.05703	8.44864	9.981	.05906	.905	.594	.862	-.211	.8957	224.245	1.000
8.023	.094	1.02317	8.64324	9.766	.05455	.917	.601	.865	-.186	.8841	234.694	1.000
8.031	.125	.99069	8.83412	9.528	.05257	.927	.608	.868	-.163	.8736	245.175	1.000
8.047	.187	.93004	9.20569	9.040	.04500	.945	.620	.872	-.122	.8553	266.233	1.000
8.063	.250	.87443	9.56484	8.524	.03678	.959	.629	.876	-.091	.8409	287.412	1.000
8.125	.500	.69855	10.89697	6.688	.01583	.991	.650	.884	-.019	.8088	373.045	1.000
8.250	1.000	.47568	13.18802	4.426	.00182	1.005	.659	.888	.011	.7952	546.398	1.000

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STATION COORDINATE, XI1= 17.500 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	1.55593	8.12014	9.151	.03895	.893	.586	.858	-.238	.9082	207.146	1.000
8.008	.008	1.52372	8.32238	8.953	.03757	.901	.591	.861	-.220	.8999	217.593	1.000
8.016	.016	1.49287	8.52021	8.764	.03710	.909	.596	.863	-.203	.8922	228.061	1.000
8.023	.023	1.46340	8.71396	8.542	.04132	.917	.601	.865	-.186	.8843	238.551	1.000
8.031	.031	1.43513	8.90369	8.385	.03611	.924	.606	.867	-.169	.8767	249.063	1.000
8.047	.047	1.38194	9.27321	8.002	.03424	.937	.615	.870	-.141	.8636	270.153	1.000
8.063	.062	1.33299	9.62979	7.625	.03097	.948	.622	.873	-.115	.8520	291.329	1.000
8.125	.125	1.17275	10.95073	6.244	.01667	.978	.641	.881	-.049	.8223	376.735	1.000
8.250	.250	.96371	13.22550	4.349	.00368	.998	.654	.886	-.005	.8025	549.508	1.000
8.500	.500	.74843	16.90309	2.663	.00044	1.003	.658	.887	.008	.7966	897.599	1.000
9.000	1.000	.54277	22.53325	1.523	-.00014	1.002	.657	.887	.004	.7981	1595.136	1.000

STATION COORDINATE, XI1= 17.875 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	1.98394	8.18553	8.224	.03813	.897	.588	.859	-.231	.9048	210.496	1.000
8.008	.031	1.95520	8.38676	8.019	.03721	.904	.593	.861	-.213	.8968	220.972	1.000
8.016	.062	1.92786	8.58366	7.836	.03652	.912	.598	.864	-.196	.8890	231.470	1.000
8.023	.094	1.90134	8.77643	7.797	.01745	.917	.602	.865	-.185	.8837	241.984	1.000
8.031	.125	1.87596	8.96535	7.501	.03324	.922	.605	.866	-.174	.8787	252.513	1.000
8.047	.187	1.82880	9.33269	7.183	.02921	.934	.613	.869	-.148	.8669	273.630	1.000
8.063	.250	1.78498	9.68724	6.882	.02598	.943	.619	.872	-.126	.8571	294.815	1.000
8.125	.500	1.63987	11.00000	5.799	.01639	.970	.636	.879	-.067	.8304	380.133	1.000
8.250	1.000	1.44115	13.26133	4.228	.00512	.991	.650	.884	-.020	.8089	552.490	1.000

STATION COORDINATE, XI1= 18.250 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	2.41298	8.24387	7.289	.03389	.899	.590	.860	-.225	.9022	213.507	1.000
8.008	.008	2.38762	8.44423	7.139	.03316	.906	.594	.862	-.210	.8951	224.011	1.000
8.016	.016	2.36331	8.64026	7.002	.02983	.912	.599	.864	-.196	.8887	234.533	1.000
8.031	.031	2.31752	9.02038	6.734	.02688	.923	.606	.867	-.171	.8776	255.623	1.000
8.047	.047	2.27513	9.38613	6.496	.02412	.932	.612	.869	-.151	.8682	276.773	1.000
8.063	.062	2.23566	9.73907	6.254	.02232	.941	.617	.871	-.133	.8600	297.978	1.000
8.125	.125	2.10310	11.04532	5.382	.01486	.964	.632	.877	-.081	.8365	383.271	1.000
8.250	.250	1.91667	13.29585	4.069	.00655	.986	.647	.883	-.032	.8146	555.370	1.000
8.500	.500	1.71180	16.94751	2.606	.00165	.998	.655	.886	-.004	.8019	902.323	1.000
9.000	1.000	1.50964	22.55896	1.521	.00020	1.000	.656	.886	-.001	.8003	1598.778	1.000

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STATION COORDINATE, XI1= 18.625 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	2.84284	8.29575	6.530	.02139	.908	.596	.862	-.205	.8931	216.203	1.000
8.008	.031	2.82014	8.49554	6.432	.02352	.913	.599	.864	-.195	.8885	226.742	1.000
8.016	.062	2.79832	8.69097	6.320	.02447	.917	.602	.865	-.184	.8836	237.294	1.000
8.031	.125	2.75689	9.06984	6.142	.01992	.926	.607	.867	-.166	.8751	258.434	1.000
8.047	.187	2.71840	9.43431	5.923	.02073	.933	.612	.869	-.150	.8677	279.621	1.000
8.063	.250	2.68246	9.78593	5.741	.01758	.940	.616	.871	-.135	.8610	300.853	1.000
8.125	.500	2.56035	11.08687	5.008	.01359	.959	.629	.876	-.091	.8411	386.160	1.000
8.250	1.000	2.38605	13.32851	3.890	.00676	.981	.643	.882	-.043	.8195	558.101	1.000

STATION COORDINATE, XI1= 19.000 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	3.27325	8.34292	6.018	.01426	.919	.603	.865	-.181	.8821	218.668	1.000
8.008	.001	3.25243	8.54226	5.932	.01660	.922	.605	.866	-.174	.8787	229.242	1.000
8.016	.002	3.23216	8.73718	5.905	.00874	.924	.606	.867	-.169	.8763	239.824	1.000
8.031	.004	3.19404	9.11500	5.660	.01836	.930	.610	.868	-.156	.8708	261.014	1.000
8.047	.006	3.15834	9.47831	5.550	.00871	.935	.613	.870	-.145	.8658	282.235	1.000
8.063	.008	3.12503	9.82871	5.307	.01647	.939	.616	.871	-.135	.8613	303.489	1.000
8.125	.016	3.01235	11.12513	4.676	.01195	.957	.628	.875	-.096	.8433	388.830	1.000
8.250	.031	2.84813	13.35919	3.707	.00697	.977	.641	.881	-.052	.8235	560.674	1.000
8.500	.062	2.65589	16.98965	2.500	.00224	.991	.650	.884	-.020	.8088	906.815	1.000
9.000	.125	2.46414	22.58417	1.501	.00053	.996	.654	.886	-.005	.8025	1602.352	1.000
10.000	.250	2.30568	30.88223	.837	.00012	.999	.656	.886	-.002	.8008	2996.176	1.000
11.000	.375	2.22351	37.38462	.593	.00004	1.000	.656	.886	-.001	.8004	4390.720	1.000
12.000	.500	2.17363	42.91355	.465	.00002	1.000	.656	.886	-.000	.8002	5785.472	1.000
14.000	.750	2.10920	52.24518	.331	.00000	1.000	.656	.886	-.000	.8001	8575.163	1.000
16.000	1.000	2.06866	60.14629	.263	.00000	1.000	.656	.887	-.000	.8001	11364.950	1.000

STATION COORDINATE, XI1= 19.750 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	4.13500	8.42831	5.328	.01201	.928	.609	.868	-.160	.8724	223.167	1.000
8.008	.031	4.11676	8.62627	5.203	.01271	.931	.611	.869	-.154	.8699	233.774	1.000
8.031	.125	4.06632	9.19539	4.939	.01036	.937	.615	.870	-.140	.8634	265.638	1.000
8.063	.250	4.00690	9.90498	4.631	.01022	.944	.620	.872	-.124	.8562	308.217	1.000
8.125	.500	3.90839	11.19395	4.130	.00925	.957	.627	.875	-.097	.8439	393.656	1.000
8.250	1.000	3.76288	13.41563	3.360	.00625	.973	.638	.880	-.060	.8271	565.421	1.000

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STATION COORDINATE, XI1= 20.500 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	4.99761	8.50451	4.779	.01001	.935	.614	.870	-.144	.8654	227.221	1.000
8.008	.016	4.98117	8.70117	4.768	.00480	.937	.614	.870	-.141	.8640	237.851	1.000
8.031	.062	4.93554	9.26667	4.445	.00942	.941	.617	.871	-.132	.8598	269.772	1.000
8.063	.125	4.88270	9.97216	4.156	.00863	.947	.621	.873	-.118	.8535	312.413	1.000
8.125	.250	4.79440	11.25451	3.705	.00748	.957	.628	.875	-.096	.8435	397.927	1.000
8.250	.500	4.66489	13.46613	3.055	.00555	.971	.637	.879	-.066	.8297	569.686	1.000
8.500	1.000	4.49805	17.06605	2.242	.00266	.984	.646	.882	-.035	.8160	914.989	1.000

STATION COORDINATE, XI1= 22.000 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	6.72459	8.63543	3.925	.00777	.939	.616	.871	-.137	.8618	234.271	1.000
8.031	.004	6.67496	9.38875	3.624	.00700	.944	.619	.872	-.125	.8563	276.927	1.000
8.063	.008	6.63218	10.08708	3.395	.00653	.949	.622	.873	-.114	.8517	319.654	1.000
8.125	.016	6.56092	11.35807	3.035	.00573	.956	.627	.875	-.098	.8441	405.283	1.000
8.250	.031	6.45444	13.55327	2.538	.00452	.967	.634	.878	-.074	.8334	577.082	1.000
8.500	.062	6.31573	17.13257	1.943	.00308	.979	.643	.881	-.046	.8207	922.136	1.000
9.000	.125	6.16016	22.67552	1.302	.00134	.990	.650	.884	-.022	.8097	1615.342	1.000
10.000	.250	6.01697	30.93494	.780	.00042	.996	.654	.886	-.009	.8039	3006.412	1.000
11.000	.375	5.94043	37.42244	.567	.00021	.998	.655	.886	-.005	.8022	4399.608	1.000
12.000	.500	5.89223	42.94337	.450	.00012	.999	.655	.886	-.003	.8014	5793.516	1.000
14.000	.750	5.82976	52.26654	.325	.00005	.999	.656	.886	-.002	.8008	8582.176	1.000
16.000	1.000	5.78973	60.16329	.260	.00003	1.000	.656	.886	-.001	.8005	11371.376	1.000

STATION COORDINATE, XI1= 25.000 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	10.18296	8.82969	2.565	.00619	.945	.620	.872	-.123	.8555	244.930	1.000
8.031	.004	10.15088	9.56969	2.389	.00539	.949	.623	.873	-.114	.8513	287.704	1.000
8.063	.008	10.12315	10.25723	2.236	.00505	.953	.625	.874	-.106	.8478	330.529	1.000
8.125	.016	10.07683	11.51151	2.005	.00448	.958	.629	.876	-.093	.8421	416.308	1.000
8.250	.031	10.00668	13.68395	1.705	.00365	.967	.634	.878	-.075	.8337	588.264	1.000
8.500	.062	9.91251	17.23578	1.362	.00256	.977	.641	.881	-.052	.8233	933.279	1.000
9.000	.125	9.79909	22.74906	1.009	.00147	.987	.647	.883	-.029	.8132	1625.837	1.000
10.000	.250	9.68108	30.98164	.675	.00058	.994	.652	.885	-.013	.8060	3015.496	1.000
11.000	.375	9.61405	37.45716	.513	.00030	.996	.654	.886	-.008	.8035	4407.777	1.000
12.000	.500	9.56960	42.97134	.419	.00018	.998	.654	.886	-.005	.8024	5801.065	1.000
14.000	.750	9.51095	52.28702	.311	.00008	.999	.655	.886	-.003	.8013	8588.903	1.000
16.000	1.000	9.47234	60.17973	.251	.00005	.999	.655	.886	-.002	.8009	11377.591	1.000

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STATION COORDINATE, XI1= 28.000 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	13.64475	8.94877	1.386	.00586	.949	.622	.873	-.114	.8517	251.580	1.000
8.031	.004	13.62826	9.68090	1.256	.00597	.953	.625	.874	-.105	.8475	294.430	1.000
8.063	.008	13.61366	10.36221	1.202	.00529	.957	.628	.875	-.097	.8438	337.330	1.000
8.125	.016	13.58845	11.60714	1.120	.00432	.962	.631	.877	-.084	.8381	423.253	1.000
8.250	.031	13.54841	13.76746	1.012	.00318	.970	.636	.879	-.067	.8304	595.467	1.000
8.500	.062	13.48999	17.30540	.883	.00211	.978	.642	.881	-.048	.8217	940.834	1.000
9.000	.125	13.41316	22.80364	.729	.00124	.987	.647	.883	-.030	.8134	1633.647	1.000
10.000	.250	13.32134	31.02069	.554	.00059	.993	.652	.885	-.015	.8068	3023.102	1.000
11.000	.375	13.26530	37.48781	.448	.00032	.996	.653	.885	-.009	.8042	4414.992	1.000
12.000	.500	13.22559	42.99681	.379	.00020	.997	.654	.886	-.007	.8029	5807.943	1.000
14.000	.750	13.17180	52.30632	.292	.00010	.998	.655	.886	-.004	.8017	6595.243	1.000
16.000	1.000	13.13518	60.19542	.239	.00006	.999	.655	.886	-.003	.8012	11383.524	1.000

STATION COORDINATE, XI1= 34.000 CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	20.57220	9.00000	.000	-.00000	.984	.646	.883	-.035	.8157	254.469	1.000
8.031	.004	20.57200	9.73620	.045	.00012	.984	.646	.883	-.035	.8156	297.803	1.000
8.063	.008	20.57118	10.42053	.092	.00028	.985	.646	.883	-.034	.8155	341.138	1.000
8.125	.016	20.56839	11.66954	.160	.00048	.985	.646	.883	-.033	.8151	427.817	1.000
8.250	.031	20.56066	13.83385	.243	.00064	.986	.647	.883	-.031	.8139	601.224	1.000
8.500	.062	20.54298	17.37345	.320	.00067	.988	.648	.884	-.026	.8117	948.248	1.000
9.000	.125	20.50965	22.86861	.367	.00054	.991	.650	.884	-.019	.8087	1642.970	1.000
10.000	.250	20.45625	31.07691	.367	.00033	.995	.652	.885	-.012	.8054	3034.069	1.000
11.000	.375	20.41642	37.53641	.339	.00021	.996	.653	.886	-.009	.8039	4426.447	1.000
12.000	.500	20.38525	43.03948	.309	.00014	.997	.654	.886	-.007	.8030	5819.476	1.000
14.000	.750	20.33951	52.34050	.256	.00008	.998	.655	.886	-.005	.8022	8606.481	1.000
16.000	1.000	20.30726	60.22376	.213	.00007	.998	.655	.886	-.004	.8017	11394.247	1.000

STATION COORDINATE, XI1= 40.000** CHANNELS- EXT SUB

XI2	STRM FNCT	X,Z	Y,R	PHI	CURV	PS/PO	PS/PT	TS/TT	CP	MACH	AREA	PT/PTO
8.000	0.000	27.50000	9.00000	.000	.00000	.998	.654	.886	-.005	.8024	254.469	1.000
8.031	.004	27.49981	9.73976	.022	.00000	.998	.654	.886	-.005	.8024	298.021	1.000
8.063	.008	27.49946	10.42717	.036	.00000	.998	.654	.886	-.005	.8024	341.573	1.000
8.125	.016	27.49834	11.68126	.065	-.00000	.998	.654	.886	-.005	.8024	428.676	1.000
8.250	.031	27.49496	13.85293	.115	.00000	.998	.654	.886	-.005	.8024	602.883	1.000
8.500	.062	27.48548	17.40135	.186	-.00000	.998	.654	.886	-.005	.8024	951.296	1.000
9.000	.125	27.46393	22.90442	.259	.00000	.998	.654	.886	-.005	.8024	1648.119	1.000
10.000	.250	27.42263	31.11626	.302	-.00000	.998	.654	.886	-.005	.8024	3041.759	1.000
11.000	.375	27.38876	37.57433	.298	-.00000	.998	.654	.886	-.005	.8024	4435.397	1.000
12.000	.500	27.36086	43.07482	.281	-.00000	.998	.654	.886	-.005	.8024	5829.036	1.000
14.000	.750	27.31841	52.37041	.240	-.00000	.998	.654	.886	-.005	.8024	8616.321	1.000
16.000	1.000	27.28820	60.24851	.198	-.00000	.998	.654	.886	-.005	.8024	11403.615	1.000

SUM-VM*COS(PHI)*DFLOW = 10025.14
SUM-(P-PSO)*COS(PHI)*DA = -26.14
TOT AXIAL MOMENTUM FLUX = 9999.00

SUM-VM*SIN(PHI)*DFLOW = 43.85
SUM-(P-PSO)*SIN(PHI)*DA = -.11
TOTAL Y-MOMENTUM FLUX = 43.74

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=W2 , STREAMLINE COORDINATE, XI2= 0.000.

XI1	S1W	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-29.99559	0.00000	0.000	0.00000	1.002	.005	.657	.7979	0.0000	1.000	1.000
4.000	7.517	-22.47846	0.00000	0.000	0.00000	1.010	.022	.662	.7902	0.0000	1.000	1.000
8.000	15.045	-14.95078	0.00000	0.000	0.00000	1.024	.054	.672	.7754	0.0000	1.000	1.000
10.000	18.817	-11.17825	0.00000	0.000	0.00000	1.041	.092	.683	.7585	0.0000	1.000	1.000
12.000	22.623	-7.37215	0.00000	0.000	0.00000	1.072	.161	.703	.7274	0.0000	1.000	1.000
13.000	24.543	-5.45249	0.00000	0.000	0.00000	1.099	.221	.721	.7000	0.0000	1.000	1.000
13.500	25.511	-4.48424	0.00000	0.000	0.00000	1.114	.254	.731	.6847	0.0000	1.000	1.000
14.000	26.484	-3.51183	0.00000	0.000	0.00000	1.130	.291	.742	.6677	0.0000	1.000	1.000
14.500	27.453	-2.54305	0.00000	0.000	0.00000	1.146	.326	.752	.6516	0.0000	1.000	1.000
14.750	27.934	-2.06163	0.00000	0.000	0.00000	1.154	.343	.757	.6437	0.0000	1.000	1.000
15.000	28.409	-1.58640	0.00000	0.000	0.00000	1.160	.358	.761	.6367	0.0000	1.000	1.000
15.250	28.873	-1.12267	0.00000	0.000	0.00000	1.166	.371	.765	.6306	0.0000	1.000	1.000
15.500	29.320	-.67557	0.00000	0.000	0.00000	1.171	.383	.768	.6250	0.0000	1.000	1.000
15.750	29.731	-.26422	0.00000	0.000	0.00000	1.175	.390	.771	.6216	0.0000	1.000	1.000
16.000	30.008	.01233	0.00000	0.000	0.00000	1.179	.398	.773	.6176	0.0000	1.000	1.000
16.250	30.464	.46833	0.00000	0.000	0.00000	1.182	.406	.775	.6142	0.0000	1.000	1.000
16.500	31.072	1.07623	0.00000	0.000	0.00000	1.186	.415	.778	.6098	0.0000	1.000	1.000
16.750	31.649	1.65330	0.00000	0.000	0.00000	1.189	.422	.780	.6062	0.0000	1.000	1.000
17.000	32.212	2.21656	0.00000	0.000	0.00000	1.192	.429	.782	.6031	0.0000	1.000	1.000
17.250	32.768	2.77223	0.00000	0.000	0.00000	1.195	.435	.784	.6000	0.0000	1.000	1.000
17.500	33.324	3.32855	0.00000	0.000	0.00000	1.198	.442	.786	.5969	0.0000	1.000	1.000
18.000	34.441	4.44541	0.00000	0.000	0.00000	1.204	.456	.790	.5899	0.0000	1.000	1.000
19.000	36.712	6.71657	0.00000	0.000	0.00000	1.222	.496	.802	.5708	0.0000	1.000	1.000
20.000	39.017	9.02165	0.00000	0.000	0.00000	1.247	.551	.818	.5434	0.0000	1.000	1.000
21.000	41.303	11.30721	0.00000	0.000	0.00000	1.276	.615	.837	.5108	0.0000	1.000	1.000
22.000	43.538	13.54280	0.00000	0.000	0.00000	1.304	.677	.855	.4782	0.0000	1.000	1.000
24.000	47.948	17.95253	0.00000	0.000	0.00000	1.349	.780	.885	.4211	0.0000	1.000	1.000

TT/TTO = 1.000

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=W2 , STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.00007	6.91374	.074	0.00000	1.002	.005	.657	.7979	0.0000	.410	1.000
4.000	7.516	-22.48443	6.92448	.097	-.00011	1.009	.021	.662	.7905	.0000	.408	1.000
8.000	15.031	-14.96881	6.94608	.277	-.00073	1.023	.050	.671	.7773	.0002	.404	1.000
10.000	18.789	-11.21107	6.97113	.514	-.00148	1.036	.081	.680	.7634	.0004	.400	1.000
12.000	22.547	-7.45362	7.02250	1.162	-.00454	1.061	.135	.696	.7389	.0014	.391	1.000
13.000	24.426	-5.57534	7.07103	1.872	-.00864	1.078	.174	.707	.7213	.0027	.383	1.000
13.500	25.365	-4.63652	7.10549	2.330	-.00840	1.091	.203	.716	.7081	.0038	.377	1.000
14.000	26.305	-3.69807	7.14886	3.054	-.01851	1.107	.238	.726	.6920	.0055	.369	1.000
14.500	27.244	-2.76041	7.20676	3.993	-.01639	1.128	.285	.740	.6707	.0082	.359	1.000
14.750	27.714	-2.29201	7.24193	4.675	-.03431	1.141	.315	.749	.6568	.0101	.353	1.000
15.000	28.184	-1.82414	7.28371	5.497	-.02671	1.158	.354	.760	.6386	.0126	.345	1.000
15.250	28.653	-1.35696	7.33247	6.523	-.04957	1.181	.403	.775	.6152	.0159	.336	1.000
15.500	29.123	-.89106	7.39216	8.191	-.07431	1.219	.489	.800	.5742	.0208	.325	1.000
15.625	29.358	-.65892	7.42779	9.297	-.09006	1.243	.543	.816	.5477	.0241	.319	1.000
15.750	29.593	-.42778	7.46943	11.433	-.22723	1.289	.645	.846	.4952	.0287	.311	1.000
15.812	29.710	-.31298	7.49411	12.774	-.17157	1.321	.717	.867	.4566	.0318	.307	1.000
15.875	29.828	-.19891	7.52199	15.082	-.51384	1.369	.824	.898	.3948	.0358	.301	1.000
15.906	29.886	-.14246	7.53813	16.826	-.52294	1.402	.897	.920	.3477	.0384	.298	1.000
15.938	29.945	-.08657	7.55613	19.028	-.78494	1.440	.983	.945	.2855	.0415	.295	1.000
15.969	30.004	-.03159	7.57670	22.169	-1.08081	1.488	1.089	.976	.1862	.0455	.291	1.000
15.984	30.033	-.00463	7.58832	24.691	-1.91520	1.511	1.141	.991	.1112	.0479	.289	1.000
16.000	30.063	.02163	7.60143	-16.188	4.74546	1.524	1.170	1.000	0.0000	.0508	.287	1.000

TT/TTO = 1.000

ADDITIVE DRAG = .0508

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=W2 . STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	COPI	(AMAX-A)/AMAX	PT/PTO
16.000	0.000	.02163	7.60143	-16.188	4.74546	1.524	1.170	1.000	0.0000	.0508	.287	1.000
16.016	.035	.04043	7.57254	-52.792	-3.90349	1.504	1.126	.987	.1370	.0445	.292	1.000
16.031	.069	.06296	7.54644	-45.845	-3.13274	1.463	1.034	.960	.2429	.0393	.297	1.000
16.047	.104	.08818	7.52292	-40.439	-2.38516	1.419	.936	.931	.3207	.0350	.301	1.000
16.062	.138	.11529	7.50159	-36.076	-2.02090	1.376	.839	.903	.3855	.0315	.305	1.000
16.094	.207	.17351	7.46465	-28.929	-1.63441	1.289	.646	.846	.4949	.0264	.312	1.000
16.125	.276	.23555	7.43451	-23.108	-1.34733	1.224	.499	.803	.5692	.0232	.318	1.000
16.156	.345	.30014	7.41028	-18.145	-1.15462	1.163	.364	.763	.6338	.0213	.322	1.000
16.187	.414	.36645	7.39127	-13.963	-.94229	1.120	.269	.735	.6781	.0202	.326	1.000
16.250	.552	.50198	7.36567	-7.774	-.64903	1.096	.215	.719	.7026	.0191	.330	1.000
16.375	.828	.77725	7.34777	-.764	-.07177	1.121	.271	.736	.6770	.0183	.333	1.000
16.500	1.104	1.05324	7.34661	.236	-.05454	1.147	.328	.752	.6507	.0182	.334	1.000
16.750	1.656	1.60517	7.35544	1.414	-.01992	1.170	.379	.767	.6268	.0188	.332	1.000
17.000	2.208	2.15698	7.37033	1.496	.01471	1.188	.419	.779	.6078	.0199	.329	1.000
17.250	2.760	2.70887	7.38163	.997	-.00013	1.191	.427	.781	.6042	.0207	.327	1.000
17.500	3.312	3.26079	7.39125	1.001	-.00013	1.193	.430	.783	.6024	.0215	.326	1.000
18.000	4.416	4.36463	7.41061	1.009	-.00013	1.197	.440	.785	.5979	.0230	.322	1.000
19.000	6.624	6.57212	7.45788	2.070	-.01403	1.197	.441	.786	.5975	.0268	.313	1.000
20.000	8.832	8.77707	7.57223	3.858	-.01321	1.225	.501	.803	.5682	.0368	.292	1.000
21.000	11.040	10.97791	7.74954	5.265	-.00874	1.263	.587	.829	.5253	.0551	.259	1.000
22.000	13.248	13.17521	7.96680	5.858	-.00063	1.304	.678	.855	.4780	.0818	.216	1.000
24.000	17.664	17.57273	8.37065	4.068	.01127	1.351	.783	.886	.4190	.1413	.135	1.000

TT/TTO = 1.000

INTEGRAL MOMENTUM BALANCE, CHN=W2 (AXIAL FORCES ONLY)

ENTERING MOMENTUM	=	134.4362
LOWER BOUNDARY PRESSURE FORCE	=	0.0000
UPPER BOUNDARY PRESSURE FORCE	=	16.1054
SUM OF ABOVE		150.5416
LEAVING MOMENTUM	=	150.6166
ERROR	=	-.0750

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=EXT , STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.00007	6.91374	.074	0.00000	1.002	.005	.657	.7979	0.0000	.410	1.000
4.000	7.516	-22.48443	6.92448	.097	-.00011	1.009	.021	.662	.7905	-.0000	.408	1.000
8.000	15.031	-14.96881	6.94608	.277	-.00073	1.023	.050	.671	.7773	-.0002	.404	1.000
10.000	18.789	-11.21107	6.97113	.514	-.00148	1.036	.081	.680	.7634	-.0004	.400	1.000
12.000	22.547	-7.45362	7.02250	1.162	-.00454	1.061	.135	.696	.7389	-.0014	.391	1.000
13.000	24.426	-5.57534	7.07103	1.872	-.00864	1.078	.174	.707	.7213	-.0027	.383	1.000
13.500	25.365	-4.63652	7.10549	2.330	-.00840	1.091	.203	.716	.7081	-.0038	.377	1.000
14.000	26.305	-3.69807	7.14886	3.054	-.01851	1.107	.238	.726	.6920	-.0055	.369	1.000
14.500	27.244	-2.76041	7.20676	3.993	-.01639	1.128	.285	.740	.6707	-.0082	.359	1.000
14.750	27.714	-2.29201	7.24193	4.675	-.03431	1.141	.315	.749	.6568	-.0101	.353	1.000
15.000	28.184	-1.82414	7.28371	5.497	-.02671	1.158	.354	.760	.6386	-.0126	.345	1.000
15.250	28.653	-1.35696	7.33247	6.523	-.04957	1.181	.403	.775	.6152	-.0159	.336	1.000
15.500	29.123	-.89106	7.39216	8.191	-.07431	1.219	.489	.800	.5742	-.0208	.325	1.000
15.625	29.358	-.65892	7.42779	9.297	-.09006	1.243	.543	.816	.5477	-.0241	.319	1.000
15.750	29.593	-.42778	7.46943	11.433	-.22723	1.289	.645	.846	.4952	-.0287	.311	1.000
15.812	29.710	-.31298	7.49411	12.774	-.17157	1.321	.717	.867	.4566	-.0318	.307	1.000
15.875	29.828	-.19891	7.52199	15.082	-.51384	1.369	.824	.898	.3948	-.0358	.301	1.000
15.906	29.886	-.14246	7.53813	16.826	-.52294	1.402	.897	.920	.3477	-.0384	.298	1.000
15.938	29.945	-.08657	7.55613	19.028	-.78494	1.440	.983	.945	.2855	-.0415	.295	1.000
15.969	30.004	-.03159	7.57670	22.169	-1.08081	1.488	1.089	.976	.1862	-.0455	.291	1.000
15.984	30.033	-.00463	7.58832	24.691	-1.91520	1.511	1.141	.991	.1112	-.0479	.289	1.000
16.000	30.063	.02163	7.60143	73.827	4.74546	1.524	1.170	1.000	0.0000	-.0508	.287	1.000

TT/TTO = 1.000

ADDITIVE DRAG = -.0508

IDENT= NASA INLET CONFIGURATION NO. 8

LOWER BOUNDARY TO CHN=EXT . STREAMLINE COORDINATE, XI2= 8.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
16.000	0.000	.02163	7.60143	73.827	4.74546	1.524	1.170	1.000	0.0000	-.0508	.287	1.000
16.023	.027	.01037	7.62602	110.429	5.62653	1.505	1.128	.988	.1338	-.0561	.282	1.000
16.047	.054	.00299	7.65202	101.145	6.22945	1.439	.980	.944	.2880	-.0612	.277	1.000
16.070	.081	.00004	7.67887	91.182	6.30030	1.270	.602	.833	.5177	-.0653	.272	1.000
16.094	.108	.00479	7.70536	67.588	14.43993	.964	-.079	.633	.8358	-.0666	.267	1.000
16.117	.135	.01905	7.72822	50.023	8.47282	.779	-.493	.511	1.0281	-.0653	.263	1.000
16.129	.149	.02827	7.73812	44.246	6.69577	.760	-.535	.499	1.0487	-.0644	.261	1.000
16.141	.162	.03834	7.74715	39.709	5.23833	.872	-.287	.572	.9305	-.0636	.259	1.000
16.152	.176	.04903	7.75543	35.931	4.46753	.568	-.965	.372	1.2770	-.0627	.257	1.000
16.164	.189	.06021	7.76306	32.786	3.63766	.831	-.378	.545	.9730	-.0617	.256	1.000
16.176	.203	.07175	7.77013	30.283	2.80153	.929	-.159	.609	.8721	-.0613	.255	1.000
16.187	.216	.08355	7.77674	28.258	2.41473	.922	-.173	.605	.8784	-.0611	.253	1.000
16.211	.244	.10775	7.78885	25.128	1.61874	.523	-1.064	.343	1.3365	-.0597	.251	1.000
16.234	.271	.13245	7.79989	23.126	1.13630	.957	-.096	.628	.8433	-.0584	.249	1.000
16.258	.298	.15748	7.81018	21.682	.80286	.850	-.334	.558	.9526	-.0580	.247	1.000
16.281	.325	.18273	7.81991	20.483	.70283	.866	-.300	.568	.9366	-.0574	.245	1.000
16.328	.379	.23376	7.83796	18.558	.53785	.650	-.780	.427	1.1737	-.0555	.242	1.000
16.352	.406	.25947	7.84639	17.788	.45474	1.027	.061	.674	.7723	-.0549	.240	1.000
16.363	.419	.27237	7.85049	17.446	.45774	.853	-.329	.559	.9501	-.0548	.239	1.000
16.375	.433	.28529	7.85451	17.103	.42480	.846	-.343	.555	.9568	-.0546	.238	1.000
16.422	.487	.33718	7.86989	15.991	.29260	.814	-.415	.534	.9905	-.0534	.235	1.000
16.469	.541	.38931	7.88443	15.206	.22860	.837	-.363	.549	.9661	-.0523	.233	1.000
16.563	.649	.49405	7.91175	14.139	.14149	.851	-.332	.559	.9515	-.0505	.227	1.000
16.750	.866	.70469	7.96173	12.608	.11132	.866	-.299	.568	.9361	-.0474	.217	1.000
17.125	1.299	1.12915	8.04711	10.371	.06332	.880	-.268	.577	.9220	-.0426	.201	1.000
17.500	1.732	1.55593	8.12014	9.151	.03895	.893	-.238	.586	.9082	-.0389	.186	1.000
17.875	2.165	1.98394	8.18553	8.224	.03813	.897	-.231	.588	.9048	-.0358	.173	1.000
18.250	2.598	2.41298	8.24387	7.289	.03389	.899	-.225	.590	.9022	-.0331	.161	1.000
18.625	3.031	2.84284	8.29575	6.530	.02139	.908	-.205	.596	.8931	-.0309	.150	1.000
19.000	3.464	3.27325	8.34292	6.018	.01426	.919	-.181	.603	.8821	-.0290	.141	1.000
19.750	4.330	4.13500	8.42831	5.328	.01201	.928	-.160	.609	.8724	-.0260	.123	1.000
20.500	5.196	4.99761	8.50451	4.779	.01001	.935	-.144	.614	.8654	-.0235	.107	1.000
22.000	6.928	6.72459	8.63543	3.925	.00777	.939	-.137	.616	.8618	-.0197	.079	1.000
25.000	10.392	10.18296	8.82969	2.565	.00619	.945	-.123	.620	.8555	-.0142	.037	1.000
28.000	13.856	13.64475	8.94877	1.386	.00586	.949	-.114	.622	.8517	-.0111	.011	1.000
34.000	20.783	20.57220	9.00000	.000	-.00000	.984	-.035	.646	.8157	-.0103	.000	1.000
40.000	27.711	27.50000	9.00000	.000	.00000	.998	-.005	.654	.8024	-.0103	.000	1.000

TT/TTO = 1.000

IDENT= NASA INLET CONFIGURATION NO. 8

UPPER BOUNDARY TO CHN=EXT , STREAMLINE COORDINATE, XI2= 16.000.

XI1	SIW	XW,ZW	YW,RW	ANGW	CURVW	PS/PO	CP	PS/PT	MACH	CDPI	(AMAX-A)/AMAX	PT/PTO
0.000	0.000	-30.17272	60.02524	.163	.00000	1.002	.005	.657	.7979	0.0000	-43.482	1.000
4.000	7.483	-22.68958	60.04721	.179	-.00007	1.002	.004	.657	.7983	.0001	-43.514	1.000
8.000	14.873	-15.29995	60.07234	.211	-.00008	1.001	.003	.657	.7986	.0003	-43.552	1.000
10.000	18.512	-11.66093	60.08625	.227	-.00008	1.001	.003	.657	.7988	.0003	-43.572	1.000
12.000	22.068	-8.10485	60.10084	.242	-.00007	1.001	.002	.657	.7990	.0004	-43.594	1.000
14.000	25.474	-4.69911	60.11558	.253	-.00005	1.001	.001	.656	.7994	.0004	-43.616	1.000
16.000	28.342	-1.83106	60.12845	.260	-.00003	1.000	.001	.656	.7997	.0004	-43.635	1.000
19.000	32.242	2.06866	60.14629	.263	.00000	1.000	-.000	.656	.8001	.0004	-43.661	1.000
22.000	35.963	5.78973	60.16329	.260	.00003	1.000	-.001	.656	.8005	.0004	-43.687	1.000
25.000	39.645	9.47234	60.17973	.251	.00005	.999	-.002	.655	.8009	.0004	-43.711	1.000
28.000	43.308	13.13518	60.19542	.239	.00006	.999	-.003	.655	.8012	.0003	-43.734	1.000
34.000	50.480	20.30726	60.22376	.213	.00007	.998	-.004	.655	.8017	.0002	-43.777	1.000
40.000	57.461	27.26820	60.24851	.198	-.00000	.998	-.005	.654	.8024	.0000	-43.813	1.000

TT/TTO = 1.000

```
INTEGRAL MOMENTUM BALANCE, CHN=EXT      (AXIAL FORCES ONLY)
   ENTERING MOMENTUM               =  9999.0358
   LOWER BOUNDARY PRESSURE FORCE   =    -1.1715
   UPPER BOUNDARY PRESSURE FORCE   =      .0051
        SUM OF ABOVE                  9997.8694
   LEAVING MOMENTUM                =  9998.9977
        ERROR                      =    -1.1282
```

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********** ENDJOB **********

12.0 PROGRAM INPUT SHEETS

∇2 input tape? output tape?
T or F T or F

1 STC ____ ____

Mach number, ambient pressure and temperature, fluid properties

$A (1.) (1.) (1.) (1.4)

MACHØ=________, TSØ=________, PSØ=________, RG=________, GAM=________,

Highlight radius, maximum body radius, body closure tolerance

RHL=________, RM=________, TTE=________,

axisymmetric or planar?
(T) or F

AXI=__________,

spacial grid refinement criteria, see notes

GR(1)=________, ________, ________, ________, ________, ________, ________,

SGR(1)=_______, ________, ________, ________, ________, ________, ________,

NGR=________,

GZ(1)=________, ________, ________, ________, ________, ________, ________,

SGZ(1)=_______, ________, ________, ________, ________, ________, ________,

NGZ=________,

maximum Mach number increment between grid points

streamwise direction (0.1) normal direction (0.1)

VMG1=_________, VMG2=___________,

maximum number of refinements

MAXIT=________,

$

Boundary Coordinates

---

boundary name   channel name

2 4   14   24

2 BDY __________ __________

upper boundary? T or F   angle input? T-no, F-yes

$A [1] UPPER=______, ZRØNLY=________,

Z   R   ANGD

B(1)=__________, __________, __________,
__________, __________, __________,
__________, __________, __________,
__________, __________, __________,
__________, __________, __________,
__________, __________, __________,
__________, __________, __________,
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STREAMTUBE CURVATURE PROGRAM

Feb. 1972

Page ____ of ____

Channel Flow Properties

STC/Sheet-3

---

channel
name

2 4 14

3 CHN ________

$A

ratio of specific heats (1.4)	gas constant (1.0)	flow rate may be adjusted? (T) or F

GAM=________, RG=____________, VARY=__________,

stagnation properties, see notes 3 and 4

total temp	total pressure

TTØ=__________, PTØ=______________,

Mach no.	static temp	static pressure

MACHØ=________, TSØ=_________, PSØ=_______________,

flow area normalized by A_{HL}.

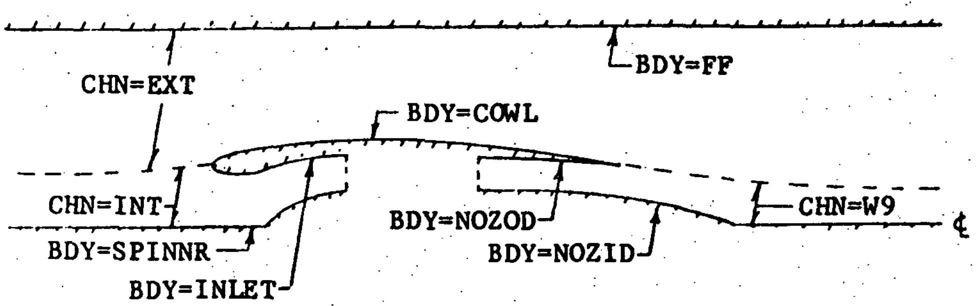
AØ=______________________,

$

General Instruction and Notes for Sheet-1 of the STC Input Forms

1) The STC Program computes the subsonic and transonic field of inviscid flow past (and within) arbitrarily shaped planar and axisymmetric bodies. Inlet and exhaust nozzle flows wherein there may exist jet streams with differing energies are typical applications.

2) The total flow is composed of one or more streams, the properties of which are to be listed on Sheet-3 (except as noted below). Each stream occupies a "channel" which is identified by a one to six character alphanumeric word. Each channel must be bounded, at least in part, by an "upper boundary" and a "lower boundary". Each boundary is also given an identifying one to six character name and the coordinates are listed on Sheet-2. The following sketch illustrates the naming of channels (CHN) and boundaries (BDY).



An external flow channel must be named EXT, the recommended name for the inlet capture flow channel is INT, and the far-field interface boundary must be named FF. Otherwise the selection of the channel and boundary names is arbitrary. The special channel names EXT and INT cause extra streamlines to be placed in the first refined grid. The boundary name FF indicates that the boundary condition on FF is to be obtained from an analytic far-field solution.

There is no specific limit to the complexity of the flow field in regard to the number of channels or the number of boundaries. Limits are set on the total amount of data which may be input.

3) The solution method consists of constructing a grid of streamlines and orthogonal lines. Starting with two streamlines per channel (one for each boundary) and an orthogonal passing through the first and last point of each boundary, the grid is automatically refined by dividing the grid intervals in half and in half again as required. The numerical resolution, the solution accuracy and the computer execution cost are all directly related to the extent of grid refinement. The input variable MAXIT determines the maximum number of refinements. Providing this limit is not exceeded, the grid will be refined, locally as required, until the spacing of orthogonals and streamlines is less than the value determined from the SGR and SGZ tables and the Mach number difference between any two points on a streamline or an orthogonal line is less than VMG1 and VMG2, respectively. Grid size values versus radius (or y-ordinate) are to be tabulated after SGR and GR, respectively. NGR is the number of entries in each list. Grid size versus the axial coordinate is to be tabulated after SGZ and GZ, respectively. NGZ is the number of GZ values. If dimensional values of RG, TSO and PSO are input (see Note 6), then VMG1 and VMG2 must have units of velocity rather than Mach number. See supplemental notes for additional details.

A partially refined grid may be saved on tape by specifying a T in column 24 of the first card, or read from a previously created tape by specifying at T in column 14.

If TAPE 1 and/or TAPE 2 are not assigned via a REQUEST card, they are assigned to disc. This allows the user to obtain output for a given refinement level and provides the option of changing input parameters on the restart. For the restart case, specify a T in column 14 of the first data card and include in the $A list only those input quantities (viz; MAXIT) which differ from those originally input.

4. In the initial calculation grid, an orthogonal line will pass through each leading and trailing edge point and through each sharp corner point (i.e. a point on the boundary with an angle discontinuity). It is not possible to analyze a configuration in which two or more of these points

are approximately opposite to each other. For example, if a configuration contains more than one leading edge, the edges must be staggered relative to the streamwise direction.

5. A free stream Mach number is specified by supplying a value of MACHØ.

6. Perfect gas assumptions are employed and the levels of ambient pressure and temperature may be dimensionless (TSO=PSO=RG=1) or dimensional. Dimensional values in a consistent set of units as described in Reference 5 should be supplied if boundary layer calculations are requested.

7. A reference (or highlight) area is calculated from the input value of R_{HL} as follows:

axisymmetric: $A_{HL} = \pi R_{HL}^2$

planar: $A_{HL} = \Delta y_{HL} = R_{HL}$

This reference area (or Δy in the planar case) is used for defining the mass flow for each channel. See STC/Sheet-3 note ___.

8. Computed pressure drag forces are normalized by the (maximum) body area where

axisymmetric: $Am = \pi R_m^2$

planar: $A_m = \Delta y_m = R_m$

9. Finite trailing edge thickness is permitted; the maximum thickness, or body closure tolerance, is to be supplied after TTE.

10. On this and the following input sheets, the values in parenthesis are used if other values are not input.

<u>Notes for Sheet-2 of the STC Input Forms</u>

1. Use one of these sheets for each boundary. Supply a one to six character name to identify the boundary in column 14 of the first card. Also indicate the name of the channel to which the boundary is adjacent in column 24. On the second card indicate whether the boundary is above (UPPER = T) or below (UPPER = F) the channel.

2. The upper or lower "contour" which bounds a given stream may be composed of several "boundaries". In this case an input sheet must be completed for each boundary; the last point of the first boundary must have the same coordinates as the first point of the second boundary, and so forth. This option is useful when considering variable geometry configurations such as flaps or movable nozzle parts. The movable part may be translated and rotated, as indicated by Note 8, while the fixed part is held stationary.

3. List values of Z (or X), R (or Y) and the surface angle in degrees at discrete points along this boundary contour after the symbol "B(1)=". Points at sharp corners must be listed twice, one time for each angle which exists at that point. In each interval, the STC Program fits a locally rotated cubic polynomial. The input points must be smooth and consistent with the specified angles.

   All points are to be listed in the streamwise direction. For an inlet lip, the points are listed by starting at the highlight point and then proceeding around the nose to the trailing edge or downstream boundary. The internal and external surfaces are listed separately under different boundary names. However, the coordinates of the first point must be the same with ANGD equal to +90° for the external surface and -90° for the internal surface.

   It is recommended that the boundary coordinates and angles be obtained from an analytic definition of the contour, and that around the nose, angle variations between points be 20° or less.

4. Pressure and Mach number distribution data will be printed at each orthogonal intersection with the boundary, and not at each input boundary point. Orthogonal stations, however, will be placed at any repeated point in the boundary table. List the same points twice if it is desired to have an orthogonal placed in that position. (This option is modified slightly when ZRONLY = T.) Orthogonal stations are always placed at the beginning and end of a boundary and at a juncture point between boundaries along the same contour.

5. If the coordinates but not the angles are known, the third column in the B-input array may be omitted. In this case specify ZRONLY = T and list the

coordinates twice at any point where a curvature jump or an angle jump exists. The double points will later be deleted if the angle discontinuity is less than 0.01 degrees. These double points are removed because extra calculation stations (see Note 5) are usually not desired at such points. However, the double point angle tolerance, DBLPTS, preset as 0.01, may be input as zero if such double points are to be retained.

6. With either input option, care must be taken to specify the coordinates with precision. The round off or reading error of the coordinate data should be less than $\Delta S^2/(10*L)$, where ΔS is the local distance between points and L is some characteristic length, say the length of the cowl. Conversely, the spacing between points should not be less than $(10\ \delta L)^{1/2}$ where δ is the relative accuracy of the coordinate data. The tabulated output curvatures may be consulted to verify the smoothness of the input data.

7. NACA Series 1 Cowl coordinates are stored internally. With the ZRONLY = T option they may be selected by listing:

B(1) = 991, 1,	
X_1, Y_1,	Series 1 Segment
Y_2, Y_2,	
X_2, Y_2,	
___,___,	Cowl Aft Segment

where X_1, Y_1 are the highlight coordinates and X_2, Y_2 is the position of the maximum diameter at the end of the Series 1 contour segment.

8. The input coordinates of a boundary may be adjusted by supplying the following input quantities not shown on the front of this sheet:

ROTATE	angular rotation in degrees
ZPIVOT RPIVOT	pivot coordinates
SCALE	multiplicative constant to be applied to the coordinate data
ZTRANS	translation increment in the axial direction
RTRANS	translation on increment in the radial/vertical direction

The order of transformation is rotation, scaling and translation. Hence, the pivot coordinates are in the same coordinate frame as the input data and the translation increments are in the rotated coordinate frame after scaling. It is only necessary to input data for the transformation operations to be executed.

Notes for Sheet-3 of the STC Input Forms

1. Use one of these sheets for each channel to supply entrance flow properties. (See exception under Note 5).

2. Of the input items shown on the face of the input sheet, use only those which are required for the selected options.

3. The total pressure and total temperature may be input by either of the following two procedures:

   a) Specify TTO and PTO if the stagnation properties are known. These values may be normalized by the free stream ambient temperature and pressure.

   b) Specify MACHO, TSO and PSO if the static properties and Mach number are known. Again TSO and PSO may be normalized by the free stream ambient values. If only MACHO is supplied (TSO & PSO are omitted) the TSO and PSO values from STC/Sheet-1 will be used.

   If neither of the above is input, free stream values as supplied on Sheet-1 are used for MACHO, PTO and TTO.

4. If the gas constant, RG, is different from the value supplied on STC/Sheet-1, supply the value which applies to this channel. RG, TSØ TTO, PSO and PTO may all be given as dimensionless (normalized by free stream ambient) or dimensional using a consistant set of units.

5. Input a value AO for the determination of the channel flow rate. AO is an area fraction mormalized by A_{HL} as defined under Note 7 of Sheet-1; the (dimensional) channel flow area is then the product $AO*A_{HL}$. The flow rate for the channel is computed by using one-dimensional relations from the total properties (as determined under Notes 3 & 4), the supplied Mach number, MACHØ, and the flow area. For internal inlet channels, specify R_{HL} as the highlight radius and AO as the mass flow ratio.

5. If for any channel the input data on this sheet is not supplied, the reference properties on STC/Sheet-1 will be employed and the frontal area calculated at the entrance station will be used. This option is suggested for an external stream.

7. Although approximate flow rates must always be supplied according to Note 5, the program will adjust channel flow rates as required to meet the zero pressure loading conditions at a trailing edge or to meet a maximum (choked) flow rate. The number of channels which require flow rate adjustment is equal to the number of trailing edges. If the flow rate is not to be varied for this channel, specify VARY = F.

Grid Refinement Criteria - Supplemental Notes

One of the important controls that the user should exercise in operating the STC program is the Grid Refinement Specification. In simpliest terms the user is required to input the following three quantities:

SGR = ____, Nominal distance between streamlines and between orthogonal lines

VMG1 = ____, Nominal Mach number (velocity) difference between points along a streamline

VMG2 = ____, Nominal Mach number (velocity) difference between points along an orthogonal line

Note, if dimensional values of the perfect gas constant and temperature are input then VMG1 and VMG2 are velocity differences; otherwise VMG1 and VMG2 are to be input as a Mach number difference.

To illustrate the function of these input items, consider the question of whether or not a new orthogonal line should be inserted between existing orthogonals as shown in Figure 1a. To answer this question, the program computes, say, between the (i) and (i+1) orthogonals, the following quantities at each streamline:

$$R_{s_j} = \frac{\Delta S1_j}{SG} \qquad (SG = SGR) \qquad \text{(1a)}$$

$$R_{v_j} = \frac{|V_{i+1,j} - V_{i,j}|}{VMG1} \qquad j = 1, 2, 3, \ldots \tag{2a}$$

(1b)

Figuratively speaking, these values are then plotted on Figure 2.

If all the Rs_j, Rf_j points fall outside of Region (1) a new orthogonal will not be inserted into the i,i+1 interval. But if one or more points do fall in Region (1), a new orthogonal is required. The new line will be extended to all streamlines for which the rs_j, rv_j values fall in Region (2), or to a minimum of five streamlines.

Thus, according to the criteria illustrated in Figure 2, the maximum distance between any two points along a streamline is SG (=SGR). If a velocity gradient exists along the streamline, the maximum distance between points is reduced. When the spacing ratio Rs becomes very small (Rs < 0.24) relatively large velocity differences between points is allowed, a feature which is intended to eliminate excessive refinement near stagnation points.

A similar criteria is used for determining when additional streamlines are required. The only variation is that Eqs. (1a) and (2a) are replaced by Eqs. (1b) and (2b):

$$R_{s_i} = \frac{\Delta S2_i}{SG} \tag{1b}$$

$$R_{v_i} = \frac{|V_{i,j+1} - V_{i,j}|}{VMG2} \qquad i = 1, 2, 3\ldots \tag{2b}$$

Streamlines and orthogonal lines are inserted until the above criteria is satisfied (or until the number of refinements equals MAXIT). The internal values of VMG1 and VMG2 (0.1) are appropriate for most configurations, and unless these values are to be altered the VMG1 and VMG2 input may be omitted. However, the user must always supply a value for SGR. In selecting this value care must be taken to ensure that a moderate grid will develop so that reasonable accuracy is obtained without sacrificing computing efficiency with an excessive number of grid points.

As a guide to the selection of SGR it is suggested that SGR be set to about twice the expected grid spacing. Because new grid intervals are always obtained by halving existing grid intervals, the average grid size will be less than that required to satisfy the criteria given in Figure 2.

Spatial Variation of Grid Size

For external flow problems, and some internal problems as well, it is necessary to input a spatial grid size variation. The additional input required is:

GR = ______, ______, ______, ______, ______, ______,

SGR = ______, ______, ______, ______, ______, ______,

GZ = ______, ______, ______, ______, ______, ______,

SGZ = ______, ______, ______, ______, ______, ______,

GR and SGR is a table of grid size (SGR) with radius (GR); likewise GZ and SGZ is a table of grid size (GZ) with axial position (SGZ). The value of SG in Eqs. (1a) and (1b) at any point, z,r, is then taken as the maximum of the SG's found by linear interpolation in the two tables of radial and axial variations.

Special rules which apply to these input items are as follows:

1) If a radial variation (but no axial variation) of grid size is desired, the user must input pairs of values in the SGR and GR lists. GR must be in ascending order. If grid size information is required beyond the limits of the input table, the closest values will be used. Also if the grid size is to be constant with radius no GR input is required and only one value of SGR need be supplied.

2) If an axial variation (but no radial variation) of grid size is desired, the user must supply pairs of values in the SGZ and GZ lists. Also he must input one value of SGR which is thy minimum of the SGZ values.

3) If both an axial and radial variation of grid size is desired, he should supply appropriate values in both tables. Remember that for any point, r,z, the r-coordinate will be used to obtain a grid size from the GR,SGR table and the z-coordinate will be used to interpolate in the GZ,SGZ table. The maximum of the two interpolated values will then be used in Eqs. (1a) and (1b). Generally, the SGR and SGZ values are set to small values close to a body, or region of interest, and increased to larger values as one moves away from the body.

Input Control of "Partial" Grid Lines

As noted previously, a new orthogonal lines and streamlines are not necessarily extended to the field boundary. Instead, the length of these lines is determined by the size of Region (2) in Figure 2. Notice that Region (2) is increased, and the length of the new grid lines is likewise increased, if CRX, the constant in the equation defining the lower boundary of the region, is decreased. If CRX = 0, then all new grid lines will span the field; that is, full grid lines rather than "partial" grid lines will be inserted.

Values of CRX are preset, but they may be altered by input cards as follows:

Input Name (a)	(b)	Preset Value	*Used for Extending*
CRX(1)	CRXSL	.375	New Streamlines
CRX(2)	CRXOL	.375	New Orthogonal lines across a subsonic region
CRX(3)	CRXSS	.125	New Orthogonal lines across a supersonic or mixed flow region
CRX(4)	CRXE	0	New orthogonal lines which cross a sonic line
CRX(5)	CRXC	0	New Orthogonal lines which cross a supersonic to subsonic compression line

If two or more of the above values apply, the smaller value will be used.

Recommended Spatial Grid Variation for an Inlet Configuration

Typical input for the spatial variation of grid size for an inlet configuration is given in Figure 3. In this case all dimensions are normalized by the highlight radius. The quoted values of SGR, GR, SGZ, GZ should be scaled by the highlight radius for a given problem. Notice that the combination of the axial and radial variations yields contours of grid size which are roughly centered about the leading edge.

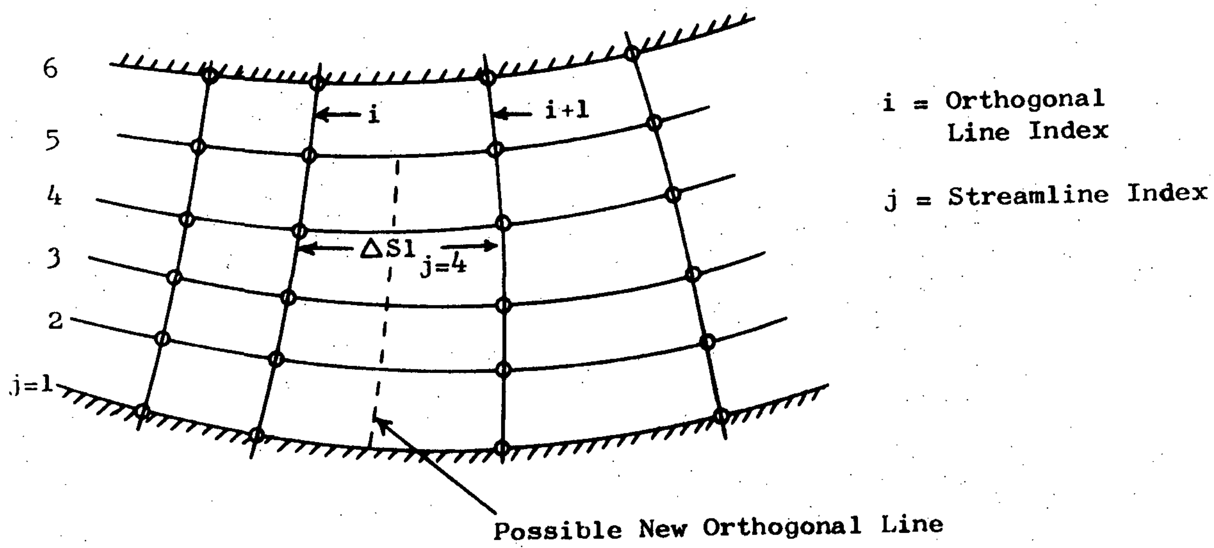


Fig. 12-1a Insertion of a New Orthogonal Line

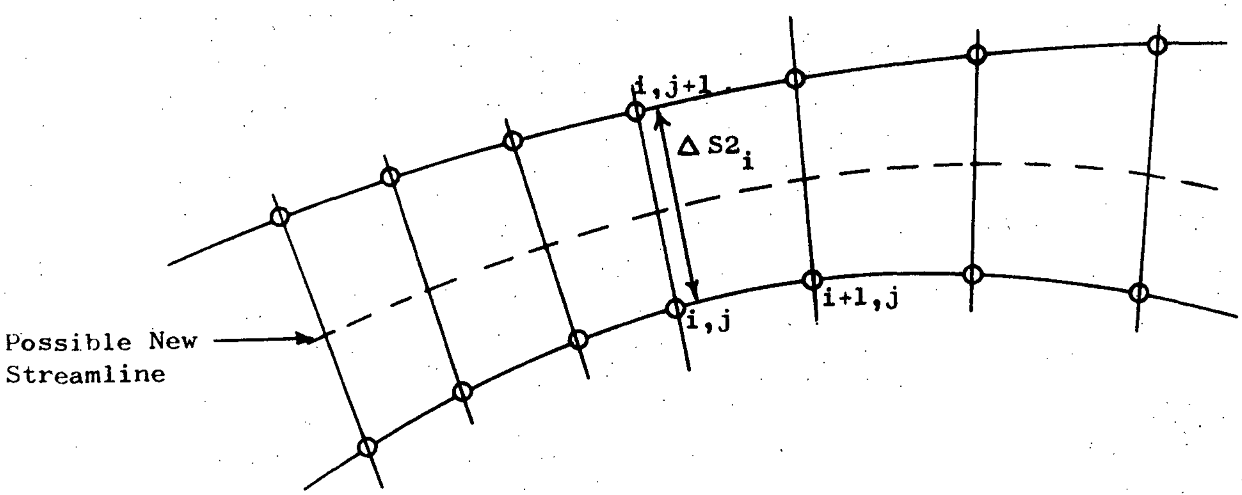


Fig. 12-1b Insertion of a New Streamline

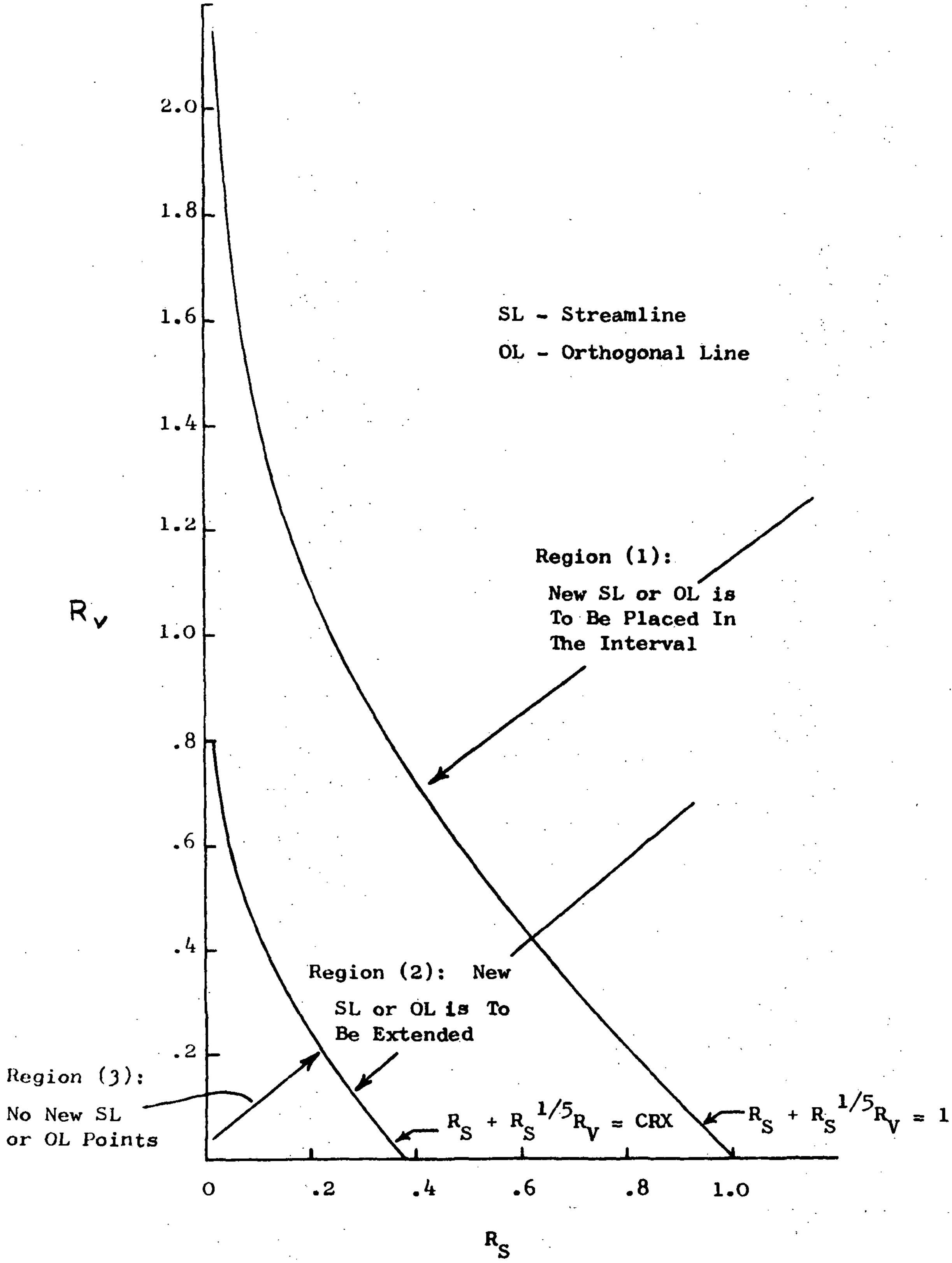


Fig. 12-2 Grid Refinement Criteria

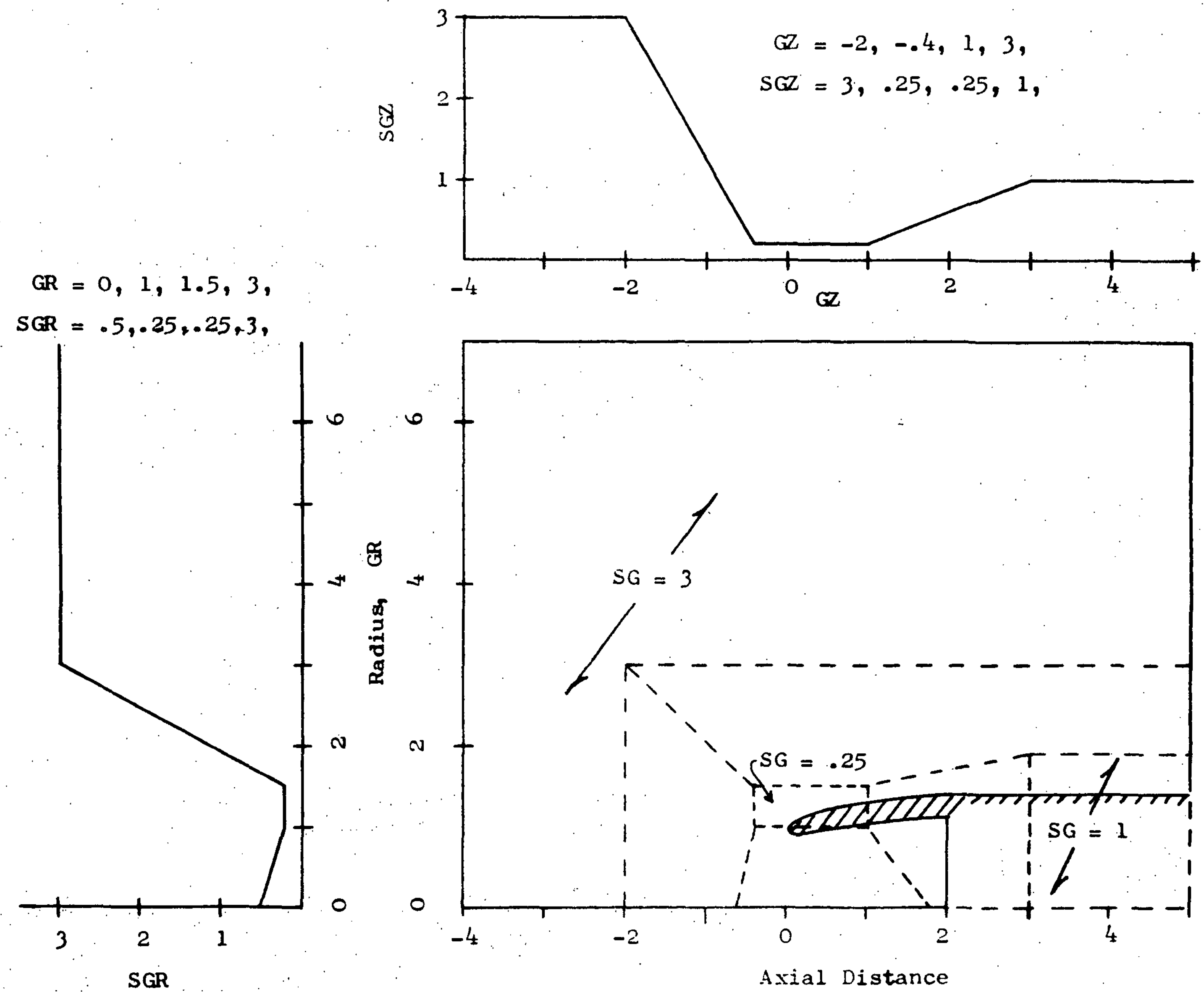


Fig. 12-3 Typical Spacial Grid Size Specification For An Inlet Analysis

13.0 REFERENCES

1. Smith, L.H., Jr., "The Radial-Equilibrium Equation of Turbo-Machinery", Journal of Engineering for Power, Trans. ASME, Series A, Vol. 88, 1966, pp. 1-12.

2. Novak, R.A., "Streamline Curvature Computing Procedures for Fluid Flow Problems", ASME Paper 66 -- WA/GE-3, 1966.

3. Katsanis, T., "Use of Arbitrary Quasi-Orthogonals for Calculating Flow Distribution in the Meridinal Plane of a Turbomachine", NASA TN D-2546, 1964.

4. Keith, J.S.; Ferguson, D.R.; Merkle, C.L.; and Heck, P.H., "Analytical Method for Predicting the Pressure Distribution about a Nacelle at Transonic Speeds", NASA CR-2217, General Electric Company, February 1973.

5. Ferguson, D.R., "STC-SAB Program Users Manual for the Turbulent Boundary Layer and Turbulent Separation Prediction Methods Employed in the NASA Langley Streamtube Curvature Computer Program", NASA CR-112240, General Electric Company, February 1973.